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E.C.A. and the Register

Victims of Circumstance

IN the matters at issue between the Electrical Contractors' Association and the National Register of Electrical Installation Contractors there is much justification for the arguments of both sides. The ideas which inspired the founders of the Register were sound but they were capable of two interpretations. One was that the public would not tolerate compulsory registration of electrical contractors and their operatives but that it might (and should) be willing to support a voluntary scheme designed to protect it from the men who put in dangerous installations, employing inferior workmanship and materials. The other interpretation seems to have gone farther than this by regarding the Register as a stepping stone to eventual compulsory registration.

Long-Standing Aims

The Electrical Contractors' Association had advocated compulsory registration long before the Register was instituted, but it realized that as an interim measure a voluntary system might go some way towards achieving its aims. These aims, it has been stressed, were not to make a "closed shop" of the industry but to ensure the safety of life and property which shoddy work endangered. Members of the E.C.A. were therefore enjoined to support the Register and throughout its twenty-three years the Register has been kept going very largely by this support.

The E.C.A. thought that the far greater number of non-Association contractors, sometimes estimated at anything up to 10,000, would become registered or in default would be unable to obtain business. This, it claims, has not been realized and it has come to the conclusion that the best way of achieving it is to proceed to make the Association better known to the public as a body of contractors with guaranteed high standards and stability. The raising of the status of its members is obviously one of the first aims of an organization of this kind and the members may be excused for thinking that they should no longer dissipate their energies and funds by popularizing two bodies whose objects are similar and which are similarly composed.

Independent Judgment

We suppose that the principal argument against this "unilateral" action is that certification by an independent and representative board must be of greater value than claims made by a body concerned primarily in promoting the interests of its members, to the possible exclusion of others. It may be said that any registration board set up under a compulsory scheme would necessarily be independent of any employers' or employees' organizations, although these might be represented. The E.C.A. would have to accept this but would still, no doubt, press the claims of its members to the prior consideration of the public.

Lack of publicity has dogged the Register since its inception. Such publicity as it has obtained has been financed mainly from the fees of members of the E.C.A. Rather belatedly, the Register has recently decided to seek the financial aid of the electricity supply industry,

which is intimately concerned, but its chances of securing this assistance are not improved by the prospective loss of revenue due to the withdrawal of E.C.A. members.

The whole of this unfortunate situation has arisen through no fault of those directly concerned. They have all done their best but the limitations have proved too much for them. It would have been better for the Register if some of the sponsoring bodies had rendered more assistance. Their representatives have laboured hard for years without any hope of any sort of gain—not even kudos—and generally speaking their nominating bodies have been content to regard this almost entirely personal work as a sufficient contribution to the success of the scheme.

Measuring Loads

IT is often less easy than it sounds to obtain data relating to the use of electricity by groups of consumers. Apart from difficulties that arise from the lay-out of the distribution network, ready means of making measurements (other than those required for normal operation) are not usually provided in substations. In view of the importance of obtaining such information for housing developments, provision of the requisite facilities in new substations should generally be well worth while. Some practical suggestions to that end are given in E.R.A. Technical Report K/T121, by J. L. Carr (2s. net), which includes a diagram showing a recommended arrangement of links and terminals for current-transformer secondaries which could be fitted to the transformer metering panel.

Power Station Architecture

THERE are many existing examples, at home and abroad, to prove that electric power stations can actually be handsome additions to a district rather than blots on the landscape. But to ensure this, collaboration with architects and others who may possess an æsthetic sense superior to that of many engineers is necessary. The Royal Fine Art Commission, whose seventh report is referred to in this issue, considers that as a result of the co-operation of the Electricity Commissioners with architectural experts the general standard of design of power station buildings has already been greatly improved.

Spare-Time Employment

THERE was an article in last week's *Electrical Review* by Mr. F. E. Sugden commenting on a recent case in which the Appeal Court held that five employees of a company were not entitled to work for a rival concern in their spare time. Mr. Sugden expressed the opinion that the decision did not govern the case of an employee whose spare-time work did not affect his employer's interests. Dumfries Town Council Electricity Committee has instructed the electrical engineer to intimate to employees in his department that the Committee "views with disapproval" the carrying out of wiring work by these employees outside the hours of employment. In this the Committee will have the support of the local electrical contractors and, we should think, of members of the E.T.U. employed by the contractors.

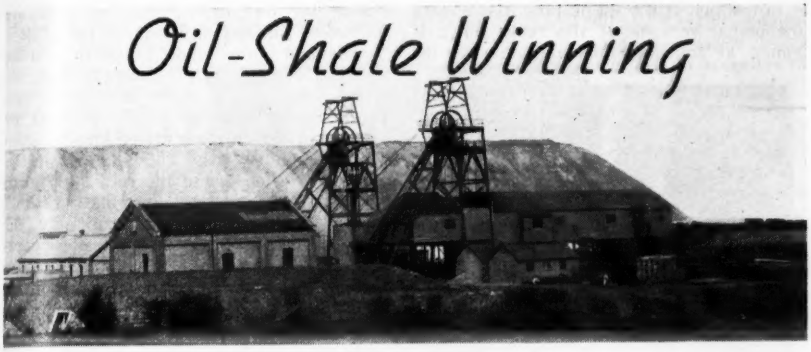
One Big Union?

AMALGAMATION or federation with other unions in the engineering industry was discussed at last week's E.T.U. conference when the president (Mr. F. Foulkes) said that no scheme would be proceeded with until there had been a plebiscite of members. It is difficult to see what advantages a "specialist" union like the E.T.U. would gain from an amalgamation in which it would lose much of its identity. Confederation is a different matter and an amendment seeking to confine negotiations to this aspect secured a great deal of support, being defeated by only one vote after officials of the union had contended that it would "tie their hands."

Export and Home Needs

WE drew attention two weeks ago to the need for a careful balance between supplies for abroad and for the home market. A letter to the *Manchester Guardian* from a firm whose products have electrical equipment as an integral part of their constitution underlines our contention. It is stated that fully 80 per cent of the firm's products incorporating electrical equipment are completed and are awaiting the delivery of the electrical gear, which is taking anything from a few weeks to three months to arrive. It is alleged that this state of affairs is general in this type of industry.

Oil-Shale Winning



Widespread Electrical Applications in the Scottish Oil Industry

BY the courtesy of Scottish Oils, Ltd., we have recently seen the extensive use which is made of electricity in the production of oils and various by-products from oil-bearing shale at their workings in Scotland where about 1¼ million tons of shale drawn annually from fourteen mines is distilled in six crude-oil works and treated in a central oil refinery. Electricity supplies to all these mines and works, including by-products and auxiliary factories, as well as a coal mine, which cover an area of approximately 75 sq miles in West and Mid Lothian, are provided by an extensive private-generation supply and distribution system which embraces 21,000 kVA of generating plant and six generating stations.

Shot holes are first drilled into the face by portable geared-motor units

The shale-oil industry is by no means a new one; it dates back to shortly after 1858 when the oil-bearing shale was discovered near Broxburn and in the West Calder district. Nor is the use of electricity new to the workings, for we saw a few motors which date back to the very early years of this century. During the past ten years or so, however, a very intensive programme of modernization, involving an expenditure of well over a million sterling, has been carried out, and the provision of new and better electrical services and equipment has been an outstanding feature. The work is evolutionary in character and will continue with the enterprise behind it, but a point has been reached at which the entire electrical scheme from generation to utilization is thoroughly up to date, and we therefore propose to publish descriptions of the electrical applications and supply and distribution system relating to this important industry.

The shale cutter is dragged into position under its own power; the face-conveyor head (left) is anchored in position by pit props

In this first article we propose to deal with the actual winning of the shale which is mined at fourteen different points in the West Calder and the Winchburgh and Broxburn districts.

At the delivery end of the face conveyor the shale is fed into one-ton hutches

The shale seams follow irregular contours as the result of earth movements over the years, and in some cases they continue on the incline to the surface. In the latter cases opportunities are afforded to approach the underground working by inclined shafts, virtually following the actual seams, and the workings in these instances are termed mines. Otherwise the approach to the seams is made by vertical shafts, and the workings are then known as pits.

There are nine mines and five pits in the area, one pit and three mines having been put into operation within the past ten years. The shafts vary in depth from about 400 ft to 700 ft, but the underground workings reach a depth of as much as 1,500 ft below the surface. The seams vary in thickness from about 5 ft up to 12 ft.

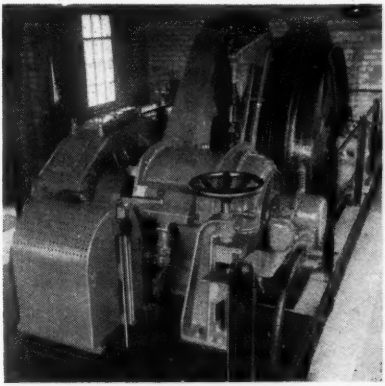
The cutting member is an endless chain set with hard-steel picks

From each shaft main roadways are driven into the seam and provide the main transport routes to the shaft. Two methods are employed for actually winning the shale—"stoop and room" and "longwall." In the former method, which is generally used, the whole area of the seam is divided into rectangular blocks or pillars (stoops) by systems of branch roads driven into the seam from the main roads. The pillars or stoops are then extracted and the roof allowed to settle down. In the "longwall" method, which is used in one shale seam only, the whole of the shale is extracted in one operation. Faces up to about 100 yards in length are cut at right angles to the roads, and as the face is advanced by the removal of the shale the space from which the shale has been wrought and the roadways leading to the face are protected by "buildings" or packs.

At the face, holes are drilled into the mass of shale to a depth of up to 5 ft. Portable electric drills, about 70 in number (Siemens-Schuckert and Crofton) are used for this purpose with considerable success. Those mostly used are 1·25-H.P. geared-motor units working at 125 V, 3-phase, with an actual speed ratio of 2,900 to 600 r.p.m. They are fed from special Metropolitan-Vickers gate-end transformer and switch units by means of five-core t.r.s. trailing cables. The fifth or pilot core for remote control is operated at 25 V, and an added safety feature is the earth-leakage protection of the equipment. These drills operate at the normal supply frequency of 50 cycles, but a few are employed with 150-cycle operation, in which case a frequency changer is incorporated in the gate-end equipment.

The face, in longwall working, is undercut at the bottom of the seam to a depth of about 4 ft. The cutters are of the Anderson Boyes type, similar to those used in coal mining. Each is driven by a 50-H.P. motor and it is dragged into position under its own power by means of an incorporated winch system and a steel rope which is conveniently anchored externally. The

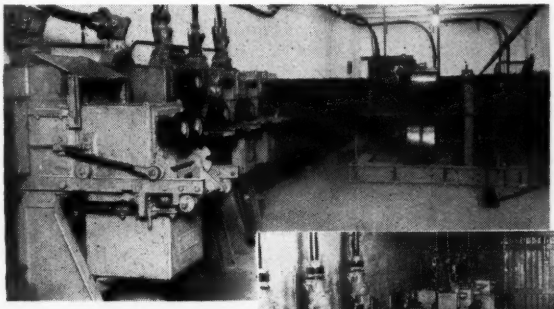
cutting member is an endless chain, set with hard-steel picks. The chain is carried on a suitable "swivelled" arm projecting from the machine body, and the cutter assembly is first "worked" into the seam and the whole equipment is then dragged along the face. The controls are actually effected locally by a control switch on the machine, but the switching proper is carried out at a suitable gate-end equipment from which the machine is supplied by a multi-core t.r.s. trailing cable with the requisite pilots for serving the control and protection gear.



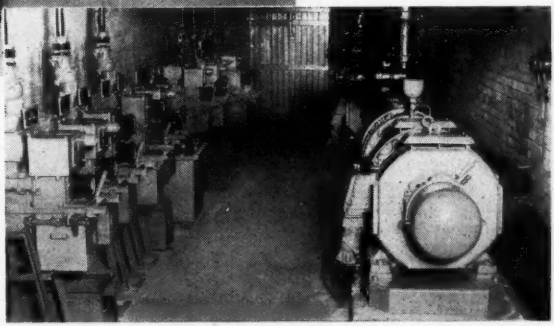
The No. 1 Philpstoun endless rope winder has a 150-H.P. drive

The next operation is to bring the face down by blasting as the result of charging the drilled holes with explosive and detonating this electrically. The broken shale thus released is then loaded on to a trough shaker conveyor which is erected parallel to the face. The shaker conveyors on all faces are Mavor & Coulson products of the type used for coal winning, and the driving units are equipped with 20-H.P. motors. The units are anchored in the required position by means of pit props. The supply and control arrangements are similar to those of the shale cutters. The transmission to the conveyor proper is via an eccentric to provide the shaking motion, and the conveyors are designed to deal with a peak load of 50 tons per hour.

At the delivery end of the conveyor the shale is fed into tubs or hutches of about one-ton capacity each, and in train formation the hutches are conveyed to the pit bottom by endless- and/or main-rope haulage systems. The general practice is to have one or more endless- or main-rope haulages for the principal conveyance to the shaft bottom, and for development work in the face area smaller double-drum (main and tail), and single-drum equipments are used for delivering the shale to the main haulage system. The main haulage equipments are generally housed in brick-built chambers, while the smaller units, which are more temporary in character, are housed in suitable niches hewn out of the shale. The underground haulages vary in size from 10 to 150 H.P., according to the underground conditions—gradients, etc.

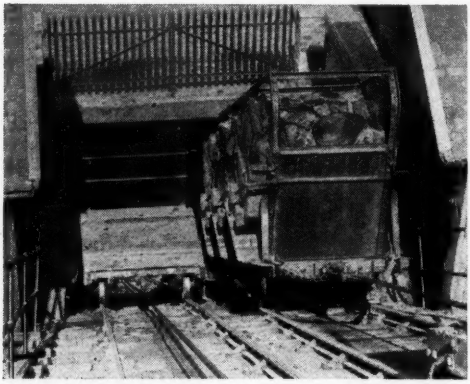


Main underground (endless rope) haulage equipment in the Breich pit



Combined pumping installation and substation in No. 1 Philpstoun mine

A good example of a section haulage system underground is the one we saw in Breich Pit. It is an endless-rope equipment with a 75-H.P. drive and transmission via worm gear to the drum shaft with a speed reduction ratio of 735 r.p.m. to 7·1 r.p.m., giving a rope speed of 1½ miles per hour. In some cases where the underground conditions are found to be suitable Diesel locomotives are employed.

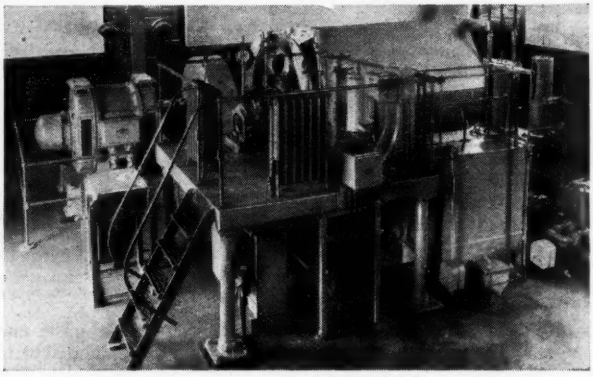


Three-deck carriages which maintain the hutches in the horizontal position are used on the steeper inclines which are served by double-drum winders

Considerable quantities of water have to be removed from the mines and for this work various pumping stations are installed underground. One of the most interesting is that in Philpstoun No. 1 mine where there are two Pulsometer turbine pumps each of which will deliver 1,000 gallons per minute against a head of 730 ft. Each pump is directly coupled to a 300-H.P., 3·3-kV, 1,480-r.p.m. slip-ring motor. An interesting aspect of the pumping station is that it is really a combined underground distribution and pumping station, in that it also houses the main underground distribution switchgear and transformers.

In general the underground distribution is provided for by a main substation at the shaft bottom, which is served by duplicate 3·3-kV or 440-V cables run down the mine or shaft. From the high-voltage switchboard in this substation, the larger utilization equipments nearby, such as the pumps mentioned, are usually supplied direct at 3·3 kV, but for the supplies to the shale cutters, conveyors, etc., the supply voltage is stepped down to 440 V. The combined pumping and distribution station in the Philpstoun No. 1 mine is a good example of this lay-out. Aligned parallel to the pumps are the 3·3-kV and 440-V switchgear and a 300-kVA transformer. In some of the larger mines and pits there are secondary substations fed at 3·3-kV from the shaft-bottom substation, and here again the voltage is reduced for nearby supplies to the smaller equipments. In this way load centres are catered for in much the same way as they are in large factories. All the electrical equipment used underground is of the standard type for coal mining, and most of the modern main distribution switchgear and control gear was supplied by the Metropolitan-Vickers Electrical Co., Ltd.

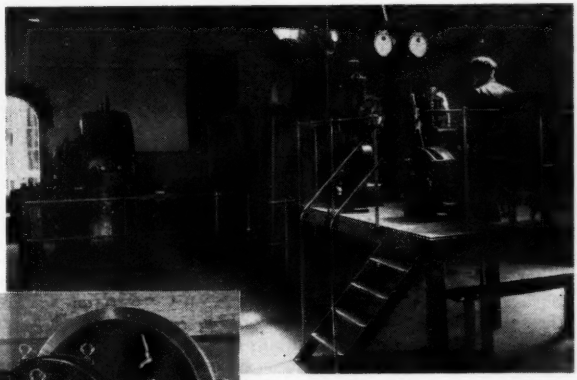
Artificial ventilation is necessary in all the pits and mines, and a good example is that at one of the most modern pits at Burngrange where there are two vertical shafts (see heading picture), each 14 ft in diameter and 442 ft deep, and the seam has an average thickness of ten feet and rises and dips at a regular gradient of 1 in 4·5 away from the shaft bottom. The ventilating fan is housed at the

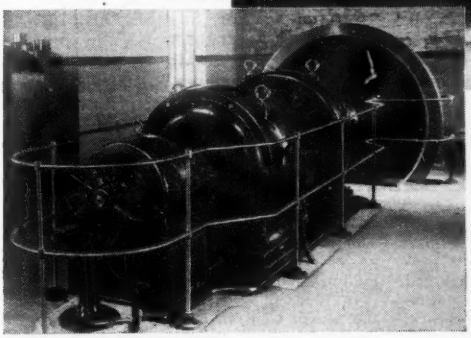


The double-drum incline winder at Hermand mine handles about a dozen hutches; incline 1 in 2½, length 2,000 ft

surface and communicates with the upcast shaft by means of a drift. It is an 84-inch double-inlet "Sirocco" equipment driven by a 60-H.P. slip-ring motor with multi-V-rope transmission, and running at 160 r.p.m. it has an output of 100,000 cu ft of air per minute at 2 in. w.g. Fans of the "Torpedo" type are also installed at several of the mines, and typical of this type is the one at Philpstoun No. 1 mine which is 90 in. in diameter, has an output of 150,000 cu ft per min at 2·5 w.g., and is driven by a s.r. motor of 85 H.P. The motor speed is 735 r.p.m. and the fan speed is 620 r.p.m.

The shale is brought to the surface by winding methods which vary according to whether the shaft is vertical or inclined. In the case of inclines, winding is effected either by endless-rope haulages which are used for material only, or by single- or double-drum haulages for both men and material. At Philpstoun No. 1 mine we saw a good example of endless-rope winding. The winder is driven by a 150-H.P., 440-V. s.r. motor which runs at 735 r.p.m. and transmits through spur gearing to give a rope speed of 1¾ miles per hour. The motor is controlled by stator oil circuit breaker and rotor liquid starter, electrically interlocked. The incline here is about 1 in 4½ and the length of the incline is 3,200 ft.





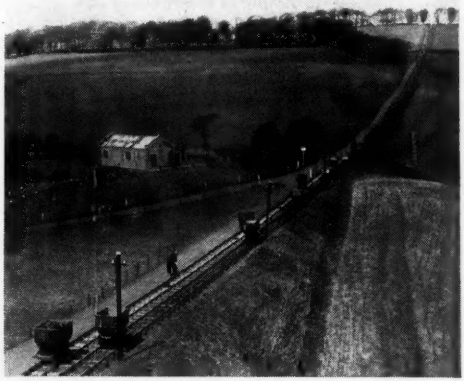
At Breich pit the winder is a 200-H.P. d.c. equipment with W.L. control and served by an Ilgner m.g. set

At the Philpstoun No. 6 mine, where the incline is rather steeper, 1 in 1½, a double-drum winder is installed. It is a 240-H.P. 480-r.p.m. 3·3-kV motor-driven equipment, and the transmission is through a double helical gear to the drum shaft. A liquid starter and reversing contactor provide for the motor control, and there is a condenser for p.f. correction. The rope speed is 1,080 feet per minute and the incline is 760 ft long. Due to the steepness of the incline, carriages are used carrying three hutches. Another double-drum incline winder is that at Hermand mine. This has a 325-H.P. drive with spur-gear transmission to the drum shaft, the motor and rope speeds being 580 r.p.m. and 1,450 ft per minute. This winder is designed to deal with 70 tons per hour from a depth of 2,000 ft on a grade of 1 in 2½.

For the vertical shafts double-drum winding is used in all cases. The winder at the Breich pit was supplied by Siemens Bros. and is driven by a 200-H.P. d.c. motor directly coupled to the drum shaft and running at 71 r.p.m. with Ward-Leonard control. The motor-generator set provided for this purpose is equipped with an Ilgner flywheel. The m.g. set motor is a 160-H.P., 3·3-kV unit which runs at 750 r.p.m., and the 170/345-kW generator supplies the motor at 500 V. The winder is designed to draw 112 tons of shale per hour from the pit, the rope speed being 1,800 ft per min. The shaft is 432 ft deep. The winders at Burngrange and Fraser pits are each designed for an output of 120 tons per hour from shafts 442 ft deep, and the rope speed is 720 ft per min. The motors are 170 H.P.

at 240 r.p.m., and bi-cylindro conical drums on these equipments reduce the peak loads during acceleration. All winders referred to except those at Breich have Metrovick electrical equipments, including overwind and overspeed devices, emergency electric brakes, and a relay system of shaft signalling.

At the surface the shale is conveyed to the particular crude-oil works served by the mine or pit concerned, either in the uncrushed form in which it is received from the shaft, or after it has been crushed at the shaft head. In the latter case the material is conveyed in rail wagons and crushing is effected at the crude-oil works. In the case of the Breich pit the crushed shale is conveyed to the works over a distance of 2½ miles by means of two endless-rope haulage systems in special transport tubs with bottom doors for direct discharging into the retorts. Each haulage covers a distance of about half the total length and with its 75-HP drive it will handle about 100 tons of shale per hour. Another mine-to-works transport scheme is that at Niddry Castle where there is an electric railway on which trains of tubs are drawn by locomotives over a distance of about 1½ miles. The supply system is 500/500 V, d.c. overhead trolley with rail earth return, and it is supplied by a glass-bulb rectifier at one end and a rotary convertor at the other end. The rectifier and rotary convertor operate in parallel.



Endless-rope haulage covers the 2½ miles from Breich pit to the crude-oil works

We are indebted to Mr. Robert Crichton, managing director, Scottish Oils, Ltd., for permission to visit the works and to publish this article, and to Mr. G. A. McLennan, chief electrical engineer, and Mr. W. Sterling, assistant electrical engineer, for their help in taking notes and photographs.

French Electrification

From Our Paris Correspondent

SINCE its creation in 1938, the S.N.C.F. had placed the highest importance on its programme of electrification, which was interrupted by the war. The extent of present electrification is 3,500 km or about 8 per cent of the network, carrying about 22 per cent of the total traffic. About 900 million kWh is consumed each year, amounting to 4 per cent of total French consumption and effecting an economy of over two million tons of coal.

After the liberation the S.N.C.F. resumed its programme for the electrification of the Paris-Lyons-Marseilles line, and for the branches Macon-Culoz and Lyons-Geneva. The first section, Paris-Lyons, should be completed by 1950, the rest in 1955. The programme will affect 1,900 km of lines, and the consumption will be about 1,000 million kWh a year.

Already a good deal of work has been done in the Haute Dordogne basin, where the falls of Coindre on the Rhue were harnessed in 1927. Maximum power is 23,000 kW and the average annual production is 100 million kWh. The Mareges plant was finished in 1936; its power is 140,000 kW, and production is 325 million kWh per annum.

In 1938, the S.N.C.F. set up two plants in the Massif Central, but they suffered from the irregular flow of the rivers. For this reason, the S.N.C.F. envisaged the construction of a large reservoir which would act as a regulator, in the Dordogne valley. Study showed that the best position was on the Dordogne itself, above the town of Bort. Work on the project was not started, owing to the war, and is now only in its early stages, It is expected to take three years. The work will comprise a barrage, of 130 metres maximum height, creating a reservoir of 400 million cu metres, with a plant at the foot of the barrage. The maximum power of this plant will be 200,000 kW, with an average annual production of 350 million kWh. Other important plants situated on the Dordogne, below Mareges, which will benefit are the Aigle, now partly in service, and the Chastang, still under construction.

Electronics Exhibition

Widening Scope for Industrial Control Equipment

THE informative symposium on electronic means of controlling industrial processes and actuating machines of many kinds and sizes at Rugby last week was a general survey of the activities of the Electronics Engineering Department (headed by Dr. A. L. Whiteley) of the British Thomson-Houston Co., Ltd., excepting certain confidential Government work still proceeding.

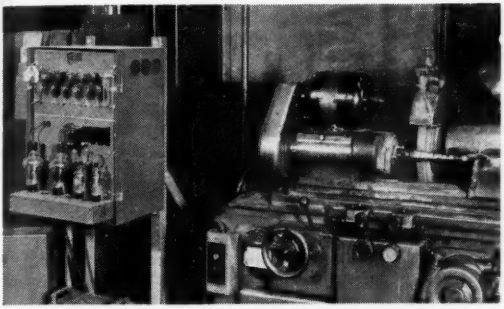


Fig. 1.—Electronic control of motor driving the work-head of a precision grinding machine

A series of short explanatory lectures was combined with an exhibition of representative apparatus and talking films depicting the variety of ways in which electronics are benefiting customers' manufacturing processes in different industries by performing functions which are impossible by other means.

Some of the applications are not new, but the prominence given to their military uses is apt to obscure pre-war developments. For instance, when the requirement arose in 1940 for a power modulator for radar systems the most suitable valve was the BT. 9 thyratron which the B.T.H. Co. had previously developed and used solely for the control of resistance welders. Similarly when the demand arose early in that year for position control from a distance for accurate naval gun laying, searchlight manipulation and the orientation of radar aerials, the B.T.H. Co. was able to complete the first electrical servo model two months after the placing of the development contract because electronic motor control was well understood and attendant problems of stabilizing systems of that kind had already been studied for industrial needs.

The better knowledge of valves and their capabilities which radio and radar training schemes for military service have imparted to substantial numbers of engineers is evidently decreasing the prejudice against the use of these devices that existed before the war. Hence the greater acceptance of so-called "valve supervision" of factory processes, which is one of the more significant factors in the changed industrial circumstances of the last six years. Possible displacement of human operators by automatic contrivances is of diminishing consequence with increasing scarcity of machine minders and process watchers. When labour is short electronic instruments will lessen the effort required of available manpower and fully utilize the productive capacity of existing machines, by speeding up the process and exercising more precise control (probably reducing rejects) noiselessly for long periods without requiring valve replacement.

But the electronics technician is not merely a valve circuit designer; he needs to be well trained in other branches of engineering, for as explained by Mr. H. de B. Knight (B.T.H. Research Laboratory, which is mainly responsible for the development of the particular types of valves used in this class of work) the principal purpose of an electronic valve is to provide a precisely determined interval during which some other function may be performed, thus necessitating mechanical components of superior quality.

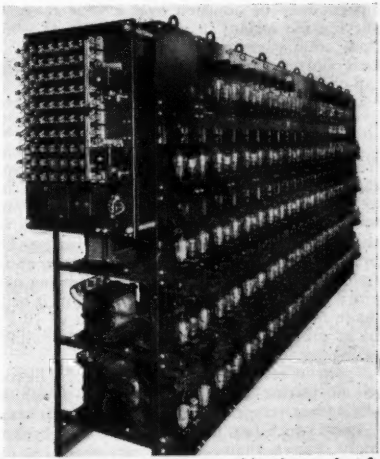


Fig. 2.—Thyratron reactor combination racks of a 52-circuit stage lighting dimmer

The quick response of electronic voltage regulators for electricity generators, some of which have been in use for ten years, is due to the absence of moving parts. Speed regulation by a simple rotatable knob (bi-phase or three-phase thyratron rectification, depending on the size of the machine) of motors ranging from a 1-H.P. precision grinder (Fig. 1) to a 4,000-H.P. wind tunnel is the equivalent of a Ward-Leonard drive with a standard 10 to 1 speed range. But a 100 to 1 ratio can be provided with good speed-torque characteristics and smooth acceleration up to the pre-set speed automatically at a finite value of armature current.

Remote control of stage and cinema lighting, with scene pre-setting facilities that do not involve duplication of power handling equipment and ventilation complications, may not be strictly industrial, but the same combination of thyratrons with saturable reactors (Fig. 2) is employed for regulating the temperature of electric furnaces.

The electronic control of a.c. resistance welders is an established specialized line, and has formed the subject of a cinema film made by the B.T.H. Co. in co-operation with the Ministry of Supply. Precise timing of the welding period may in some cases be combined with manual or even automatic regulation of current. Control may be by electronically-timed magnetic contactor, or directly by ignitron with a separate period timer. Synchronous control is considered essential for welding times of less than one-tenth second, or one half-cycle. In addition to accurate timing of the weld, current may be adjusted over a wide range by varying the instant in each half-cycle at which flow commences; this phase-shift method of heat control is more convenient than transformer tap-changing.

High Frequency Heating

For inductively heating metals with high frequency current generated by valve oscillators the B.T.H. Co. is, for the present, standardizing a frequency of 550 kc/s for the surface hardening of gear wheels and small shafts as well as for through heating for annealing and brazing. For pre-heating dielectric moulding compounds frequencies of 20 Mc/s and more are being used and a 10 Mc/s oscillator of the same type is being made for drying timber. An output of 10 kW is, at present, thought to be the most suitable rating per unit.

Ignitron loading equipment may be likened to an inertia-less switch of large power for trolley-bus, tramway, railway, lift and crane systems which feed back by regenerative braking more power than can be absorbed by d.c. distribution networks energized by mercury rectifiers. Consequential voltage rise seriously diminishes the vehicle-braking effort and is harmful to the traction motors. Thyratron detection of the onset of power reversal " fires " an ignitron in series with a loading resistance across the substation busbars, thus dissipating temporary excess of power sufficiently rapidly to restrict rise of voltage.

There are many variants of photo-electric methods of actuation, counting, inspection, the measurement and regulation of temperature, time-delay relays, electronic aids to cinema sound amplification systems and measurement of the acoustics of buildings.

Mr. D. C. Thomas explained the value of radar navigational aids to merchant ships while other ultra-high-frequency exhibits included the meteorological radisonde, a 3 cm magnetron transmitter demonstrating the narrowness of the wave band, and a linear accelerator which emits particles at a speed approximating to that of light, with a range of 10 ft in air, which has been designed for medical purposes and nuclear physics research.

Australian Notes

(From a Correspondent)

THE position regarding coal supplies in New South Wales is still critical. In Queensland, industrial troubles have led to a severe rationing of electricity supplies, and tram services are curtailed, power and light is drastically cut, and all cinemas are closed. In Victoria, South Australia and Western Australia services are normal, but here again coal supplies are on a hand-to-mouth basis. The only trouble-free State is Tasmania, where hydro-electric power is used.

A breakdown in the plant at the East Perth power house (which resulted in severe rationing of electricity supplies for nearly three weeks), has led to a demand for a Royal Commission on the occurrence. A spokesman for the State Electricity Commission, in reply, has stated that " a high and continuous strain has been placed on the generators at East Perth, and this strain must continue until the new South Fremantle station comes into operation."

Vactric Issue.—Consent has been given by the Federal Treasurer for the public issue of 20,000 5 per cent cumulative preference shares by Vactric Electric Appliances, Ltd., which proposes to manufacture vacuum cleaners, fractional horse-power motors and other electrical goods at Finsbury (S.A.). The issued capital will now be £50,000 in 20,000 preference and 30,000 " A " and " B " ordinary shares. The latter are held by Vactric, Ltd., England, in association with Adelaide and Melbourne interests.

Rise in Exports.—A steady increase in exports of electrical appliances and equipment is shown in figures just released by the Commonwealth Statistician. Exports for the year 1938-39 were valued at £822,000; by 1944-45 they had increased to £898,000; and for the year 1945-46 they had jumped to £1,450,000.

Calculating Conductor Areas

Relating Current-Carrying Capacity to Voltage Drop

By A. Salzmann,* A.M.I.E.E.

ACCORDING to the I.E.E. Wiring Rules the size of cable conductor selected must be such that it shall be capable of carrying the maximum current at a certain ambient temperature without being overheated and that the voltage drop from the consumer's terminals to any appliances (motors excepted) does not exceed 1 volt plus 2 per cent of the nominal voltage. By taking into account the diversity factor, the cross-sectional area of the cable in relation to computed maximum current can be settled with the aid of wiring tables for current rating of conductors, but it must be checked for permissible voltage drop.

A practical formula, $a = \frac{kW.L}{28{,}000}$, may be derived for this purpose, where a = cross sectional area in sq in. and L = single length of the cable in yd. The proof of this is as follows : The voltage drop between two conductors, $\triangle V$, $= (I\rho 2l)/a$, where I = max. current in A; $\rho = 0{\cdot}645/10^6$ being the specific resistance of copper in ohms per in. cube; at 60 deg. F: 2l = lead plus return, inches. If V is the declared voltage and V_p the percentage voltage drop, the cross sectional area is given by

$$a = \frac{IxV\ 2l\ \rho \times 100 \times 1{,}000 \times 36}{1{,}000 \times 36 \times V_p \times V^2}$$

As the permissible percentage voltage drop at 230 V is $\frac{1 \times 100}{230} + 2 = 2{\cdot}434$, the final formula becomes

$$a = kW.L\frac{2 \times 0{\cdot}645 \times 100 \times 1{,}000 \times 36}{10^6 \times V_p \times 230^2} = \frac{kW.L}{V_p\ 11{,}500}$$

for any voltage drop. Since $V_p = 2{\cdot}434$, then $a = \frac{kW.L}{28{,}000}$ for the voltage stipulated drop in the I.E.E. Wiring Rules, so that $V_p = \frac{2{\cdot}434\ kW.L}{a\ 28{,}000}$. This enables the permissible voltage drop to be checked for conductors with cross-sectional areas selected with a view to current density. For three-phase four-wire supply system and balanced load the formula is given by $a = \frac{kW.L}{6 \times 28{,}000}$ This expression is obtained by substituting 2l = for the single length L and kW/3 for IxV/1,000. Similarly we can derive for any supply system the formula for calculating the cross-sectional area. (See table).

System	Conductor area sq. in. "a"	Permissible voltage drop: Per cent.	Permissible voltage drop: In volts	Checking permissible voltage drop (for selected conductor size), V_p
Two-wire 230 V	$\frac{kW.L}{28{,}000}$	2·434	5·6	$\frac{2{\cdot}434\ kW.L}{a \times 28{,}000}$
Two-wire 115 V	$\frac{4\ kW.L}{28{,}000}$	2·870	3·3	$\frac{11{\cdot}5\ kW.L}{a \times 28{,}000}$
Three-wire* 2 × 230 V	$\frac{1\frac{1}{2}\ kW.L}{28{,}000}$	2·217	10·2	$\frac{kW.L}{a \times 1{\cdot}79 \times 28{,}000}$
Three-phase three-wire 3 × 230 V	$\frac{1\frac{1}{2}\ kW.L}{28{,}000}$	2·434	5·6	$\frac{kW.L}{a \times 0{\cdot}825 \times 28{,}000}$
Single-phase* three-wire 2 × 115 V	$\frac{kW.L}{28{,}000}$	2·434	5·6	$\frac{2{\cdot}434\ kW.L}{a \times 28{,}000}$
Three-phase* four-wire 400—230 V	$\frac{\frac{1}{3}\ kW.L}{28{,}000}$	2·434	5·6	$\frac{kW.L}{a \times 2{\cdot}48 \times 28{,}000}$

* Cross sectional area of neutral is half of outer.

As an example, for a three-phase 400/230-V four-wire supply system with a balanced load, find the cross-sectional area of 70 yd of horizontal main OA and 30 yd of rising main AD which is tapped at points A, B, C, D, all 10 yd. apart, for loads of 2, 5, 3 and 10 kW. The size of the cable required to carry the maximum current of 29 A is 0·01 sq in. (7/·044). This cross-sectional area must be checked for permissible voltage drop. From the table, after adding together the products of kW loading and yards for the various lengths between the points and multiplying the result by 1/6 × 1/28,000 we get a = 1/6. 1/28,000 (2 × 70 + 5 × 80 + 3 × 90 + 10 × 100) = 0·0109 sq in. Thus, while as regards the current density, the nominal cross-sectional area of each phase conductor could be 0·01 sq in., in order to

* Cornwall Electric Power Company.

prevent an undue voltage drop a larger cable must be used, the nearest standard being 0·0145 sq in. (7/·052).

As a further example, assume the load at point A to be increased by 10 kW, the size of the horizontal main OA, chosen on account of current density only (43·5 A) would be 0·0225 sq in. The cross-sectional area of the rising conductors must also be computed in relation to permissible voltage drop. From the last column in the table, the permissible percentage voltage drop for the horizontal main is . . . .

$$\frac{kW \cdot L}{a \times 2{\cdot}48 \times 28{,}000} = \frac{30 \times 70}{0{\cdot}0225 \times 2{\cdot}48 \times 28{,}000} =$$

1·35 per cent; hence for the rising conductor the voltage drop will be 2·434 — 1·35 = 1·084 per cent. and its cross-sectional area will be $\frac{5 \times 10 + 3 \times 20 + 10 \times 30}{1{\cdot}084 \times 2{\cdot}48 \times 28{,}000} = 0{\cdot}0054$ sq in., for which the nearest larger standard size of conductor is 0·007 sq in.

The size of the rising conductor must also be selected with due regard to the current density. As 0·007 sq in. would be too small to carry 26 A, 0·01 sq in. (7/·044) would be required.

Difficult Year at Birmingham

Coal Stocks at Low Level

REVIEWING the Birmingham undertaking's activities during the year ended March 31st last, the Electric Supply Committee commends the way in which the considerable difficulties of operation were surmounted. The increased efficiency of the Hams Hall "B" station and the drastic economies exercised have enabled the undertaking, of which Mr. F. W. Lawton is chief engineer and manager, to avoid any increase in basic tariffs, although certain of the larger consumers have been affected by the coal clause.

One of the most serious problems was that coal deliveries fell far short of requirements and at the end of March stocks had fallen to the unprecedented low level of less than one week's supply. Despite every effort, the rate of re-stocking has been far from satisfactory, and the Committee views the situation for next winter with grave concern.

On the generating side, an additional 50,000-kW set was brought into commission at the Hams Hall "B" station, making the total capacity of the undertaking 498,000 kW. Progress with further extensions at the "B" has been maintained in the face of difficulties, but it is not thought that the next machine will be ready for service until after the winter of 1946.

Principally due to change-over to peacetime production in factories, sales of electricity to high-voltage consumers fell by 132 million kWh, against which there was a rise in low-voltage supplies of 38 million kWh. Total sales last year were 1,166·8 million kWh compared with 1,260·5 million in 1944-45, in addition to which there was a net export to the C.E.B. of 443·7 million kWh (357·0 million). The maximum supply demanded rose from 457,500 to 487,600 kW and the number of consumers from 307,318 to 311,046.

Revenue from the sale of electricity amounted to £4,618,988 (£4,647,584), equivalent to 0·950d. (0·885d.) per kWh sold. Total income was £4,691,589 (£4,703,820). After deducting working expenses which amounted to £3,946,370 (£3,801,849), loan charges £649,856 (£663,411), income tax £25,675 (£203,999) and special expenditure £61,868 (£34,329) there was a net surplus of £7,820 (£232).

Electricity on the Dairy Farm

North American Conditions

THE Milk Commission which has been investigating milk production in the United States and Canada has submitted a report ("Milk in North America," Stationery Office, 1s. 3d.) upon conditions on dairy farms. In the course of this reference is made to the extensive use of electricity; it is said that although taking all the farms in the North American continent, only a small proportion have electricity, practically every dairy farm has electrical service. The farmers interviewed all expressed their appreciation of the benefits which they derived from the service and none complained of the cost, which seemed to vary from £1 to £3 a month.

At one of the local offices of the United States Rural Electrification Administration the Mission was given details of the methods by which the service was brought to farmers cheaply and economically. It is thought that a study of the way in which small farmers' co-operatives organize to distribute electricity to farmers in many parts of the United States would be of interest to British farmers. The electricity supply authorities in this country might also consider the methods and the costs of establishing and operating the rural services in the United States and Canada in view of their projected large-scale development programme. The Mission says the service is cheap, "and, as far as we could gather, it is not subsidized, apart from loan capital."

As regards equipment it seems that the majority of herds of over twelve have machine milking, mostly electrical. There are electrically-operated grinding mills, the hammer type being most common; automatic electrically-operated compressors for cooling; and electric pumps. The use of steam boilers and sterilizing chests seems to be the exception outside the Washington milk area where they are compulsory.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

"A Universal Plug—Now"

FURTHER to the views of "The Plain Engineer" in your issue of July 12th, the ordinary man wants to be able to use any electrical apparatus anywhere in the house with safety, ease of control, and with interchangeable connections which are cheap, unobtrusive and simple. For example, the overall sizes of plugs in domestic use might well be reduced on the lines of those developed for the Services. Therefore the introduction of complications such as fused plugs and fused sockets or more than one standard or size should be avoided unless they are first shown to be really necessary.

The main object should be to come as near as possible to the ideal and to give good technical or commonsense general explanations why some of the desirable features cannot be put into practice instead of going too deeply into technicalities for their own sake.

As to safety and standards, no amount of careful legislation will prevent modifications such as amateur wiring extensions, and the real crux of the whole matter is that the user is not unanimous on whether he prefers round- or flat-pin plugs. He usually wants to keep the kind he has already got. If either type is adopted as sole standard it will cause much inconvenience and one way of lessening this might be for the authorities to decide which should be adopted and then announce that type "X" will be regarded as the only standard in, say, three years' time.

Leigh, Surrey. PLAIN USER.

I COULD not agree more with the views expressed by "The Plain Engineer," especially as I put forward similar arguments in favour of the adoption of the existing domestic standard plug in my article, "All-Purpose Socket Outlets," in your issue of May 17th.

I would commend to the attention of the industry his suggestion that it should abandon sectional interests, even personal interests, in accepting the principle of trusteeship for the consumer, and that vested interests should no longer stand in the way of giving maximum service to the community.

While I would not go so far as to say, as he does, that the pursuit of sectional interests provides one of the reasons why the supply industry is now promised nationalization, undoubtedly a perpetuation of the personal idea held for so long by the individualists of the industry will effectively prevent the fullest possible service to the community. Electricity supply and utilization is now undoubtedly a social service in addition to being a great industry and the responsibilities must be accepted.

*London, W.*1. T. C. GILBERT.

D.C. Transmission

THE possibility of high-voltage d.c. transmission has always been one of great interest, since it avoids the complications inherent in a.c. systems. For this country however its chances are poor unless some cheaper method of conversion can be found.

Summarizing the position as it stands to-day, the advantages of d.c. transmission are that it is very stable, makes more economical use of material, can transmit 40 per cent more power and the distribution of tension across insulators is more uniform. The advantages are more apparent in cable transmission owing to the higher costs per mile.

Its disadvantages are that line insulation would be determined by surges arising from lighting, all faults develop into power arcs (compared with only a proportion on a.c. systems), more equipment would be needed since several rectifiers would be required in series, tapping points would not be practicable owing to their cost, and reactive kVA could not be transmitted and would have to be corrected at the receiving end by synchronous condensers.

Edinburgh, 4. A. ROBERTSON, A.M.I.E.E.

Electricity Tariffs

MUCH of the discussion on the "chaotic tariffs" is based on the uninformed idea that a "unit" is like a bobbin of thread and that there is no more reason why its price should vary than that the price of thread should vary. This is a fallacy. Pre-war, shops used to have after-season sales when prices for goods were reduced to half or less and yet no one complained of chaotic

prices nor did shareholders ask the directors to have standardized prices to bring them into line with what is charged in other parts of the country. Railways now are introducing cheap mid-week tariffs to improve their load factor. The variety in railway tariffs is much greater than that in electricity tariffs. Charges are varied to meet conditions and what the goods can pay.

Most people imagine that electricity costs depend mainly on coal and that water power costs nothing. They do not know that with municipalities the rates and sums of money extracted from electricity departments to help the rates, pre-war, often cost more than coal, and councillors usually have no idea how the price of electricity has been kept down in spite of the immense increase in the cost of coal and all other items. I have often tried to convince the intelligentsia that electrical men have kept costs down by their energies and by work which is done in their own time, but they don't believe it, nor that the towns will get a shock if with national supply they have to give up bleeding electricity for the rates.

Tynemouth. C. TURNBULL.

Power Station Design

Royal Fine Art Commission's Report

A SECTION of the seventh report of the Royal Fine Art Commission, covering the period 1937-1945, deals with the Commissioners' action with regard to new power stations. In the summer of 1944, the Commissioners' attention was called to proposals to enlarge and build power stations at Lincoln and Durham respectively. As these buildings were considered seriously to affect public amenities the Commissioners offered their help and were glad to be informed that the Electricity Commissioners were to hold local inquiries. With regard to Lincoln, the Commissioners say that unfortunately an architect was not called in at the early stage of the project and they were consulted too late to be able to make any effective recommendations.

They were concerned lest this might happen in regard to other stations and asked the chairman of the Electricity Commission to discuss future procedure with them. This he agreed to do, with the result that arrangements were made towards ensuring in future the early submission of plans to the Royal Fine Art Commission and the appointment of an architect to work in collaboration with the engineer from the outset. There was a strong feeling that, in the future, power stations on such a vast scale as that at Durham should be sited, as far as possible, away from historic towns and villages.

In 1945 the Commissioners' advice was sought with regard to new power stations at Bromborough, Ipswich, Poole and Croydon. They were pleased to note that the sketch plans for these stations reached a standard of design which was encouraging, and after making recommendations they had no difficulty in giving their general approval to the plans.

The Commissioners place on record their appreciation of the help and co-operation received from Sir Cyril Hurcomb, chairman of the Electricity Commission, and emphasize the importance of competent architects' advice being sought in regard to the design of power stations which invariably present important architectural as well as engineering problems. The Commissioners consider that as a result of this co-operation the general standard of design of these buildings has already been greatly improved.

Lamp Standards

The Commissioners state that from time to time they have had before them designs for street lamp standards and further recent designs have been submitted for their approval by the Association of Public Lighting Engineers. The Commissioners felt that sufficient attention had not been given to all the aspects affecting street lighting. They therefore recommended that a conference should be held representative of all concerned, with a view to coming to a more satisfactory joint solution of this somewhat complicated problem. The Ministry of Transport was also to be approached.

Trading With the Enemy

UNDER an Order made on July 6th, effective from July 9th, all existing lists of persons specified as "enemy" under the Trading with the Enemy Act, 1939, have been revoked. Orders have been made authorizing trade within neutral countries and other territory, which have at no time been enemy territory, with persons resident or carrying on business therein who continue to be of enemy status and with whom trade would otherwise be unlawful under the Trading with the Enemy legislation. Board of Trade and Custodian control is removed from moneys or property accruing from such trade. The property in the United Kingdom belonging to such persons and concerns at the date of the Order and income arising therefrom continue under control and persons in the United Kingdom who are indebted to or hold property belonging to them should accordingly continue to pay or report such debts or property to the Custodians of Enemy Property.

Further Orders vest in the Custodian certain property in the United Kingdom belonging to any persons whose name was included in the Statutory List current immediately before its revocation. Property so vested which belonged to persons and concerns who ceased to be enemies in consequence of the revocation of the Statutory List will, however, be released in due course on application, which should be addressed to the Trading with the Enemy Department, 24, Kingsway, London, W.C.2.

Porcelain Insulators

Testing for Deterioration

By G. L. Mason, A.M.I.E.E.

THE term deterioration when applied to a porcelain insulator is reserved for the process which may lead to failure of the insulator due solely to the materials and methods employed in its manufacture. It is peculiar to insulators employing cemented joints such as large multi-piece pin or post insulators, the cap-and-pin type and those with bolts or ferrules cemented solidly into the ends.

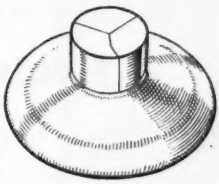
The mechanism of failure appears to be that the cement grows over a period of years, setting up internal stresses which the porcelain cannot resist due to its tensile weakness. In the majority of cases the resulting cracks are visible, common occurences being smashed ends in barrel insulators on ganged isolators or vertical cracks in the jointing ring at the bottom of the top piece of certain large multi-piece pin insulators. In the case of cap-and-pin insulators used as tension and suspension strings on very-high-voltage lines there are usually no external signs at all and the only practicable means of locating those which have deteriorated is live line testing.

It should be stated that line insulators manufactured since 1930 are showing very low rates of deterioration and it appears probable that the improvements in manufacture which became general at that time have largely eliminated the trouble.

The normal characteristics of sound and faulty 10-in. diameter cap-and-pin insulators are given in the accompanying table and typical cracks in the boss of a faulty cap-and-pin insulator after the cap has been removed are shown in the diagram.

It is highly important that all deteriorated insulators should be located and removed. Not only does the presence of one lower the factor of safety of a string considerably, but if flash-over should occur the power arc may puncture and disintegrate the faulty unit completely, dropping the conductor. Cases have been known where this has occurred at a suspension string and the line has been re-energized with the conductor only a few feet clear of the ground.

If live-line testing is to be successful in locating all deteriorated insulators, it follows from the table that all insulators must fall into one of the two classes given; that is to say that by the act of cracking there must be an instantaneous conversion from a sound insulator with an insulation resistance greater than 100 megohms to a faulty one with less than 4 megohms. The author, however, has reason to believe that there is an interim state between the two conditions. A check on a doubtful reading obtained in a live-line test was extended to include all the insulators on the support and one unit which was perfectly satisfactory on the live-line test was found to have an insulation resistance of 40 megohms. A very limited amount of testing disclosed two more insulators with values of 35 and 50 megohms, both of which had completely normal readings on the live-line test. In the laboratory all three punctured in air, one at 17 and the two others at 25 kV and were found to have typical cracks when dissected.



Typical cracks in a faulty cap-and-pin insulator

	Live line test	I.R.	Dry flashover	Puncture
Sound insulator	Sustains voltage normal to its position in string	Clean:— > 200 MΩ Dirty but dry:— > 100 MΩ	> 70 kV	> 100 kV under oil
Faulty insulator	Very low or zero reading	< 4 MΩ		< 12 kV in air

It is difficult to account for these results. There are four obvious variables which might affect them, namely, width, age, degree of pollution and humidity of the cracks. Width appears to have little effect, as it is increased

by the power arc on puncture test, yet the same results can be obtained repeatedly. No signs of pollution have ever been observed by the author in any crack under the cap of a cap-and-pin insulator, which leaves humidity as the most hopeful variable. The check test was taken during a very hot and dry period but a number of faulty insulators were found which gave the normal readings of 4 megohms or less. It may be that the freaks were all very new cracks and that in the prevailing weather conditions there had not been sufficient time for any moisture to be deposited. Yet if moisture were a major factor controlling the results, one would expect it to be expelled by the first power arc and that subsequent breakdowns would be at a higher voltage. Further investigation would be interesting.

Consideration of the above figures shows that there is no reason why these insulators should upset the normal potential distribution on a string unless they are in the highly stressed position adjacent to the line. Since both the live-line tests now employed depend on identifying departures from normal potential distribution it follows that they are not completely satisfactory. The ideal apparatus would be adequately insulated for 132 kV, easily portable by two men and would test the insulation resistance of each unit instead of the voltage sustained.

Registration of Contractors

E.C.A. Explanation and Future Plans

REASONS for the decision of the Electrical Contractors' Association to advise its members not to renew their registration with the National Register of Electrical Installation Contractors were given in our issue of June 28th (p. 1016), together with the Registration Board's replies to the points raised.

In a re-statement and amplification of these reasons the E.C.A. points out that its decision was not dictated by any hostility to the Register, for which, indeed, it has been principally responsible from its inception. The sole consideration was the efficacy of the Register and it is contended that the original aims have not been achieved. At the inauguration of the Register it was regarded by the E.C.A. as the only generally-acceptable alternative to compulsory registration of electrical contractors and operatives which the Association had advocated for many years. It was hoped that voluntary registration would help to ensure the safety of the public by eliminating from the electrical contracting industry the unqualified and incompetent practitioners who crowded into the industry after the 1914-18 war.

Members of the Association and of the E.C.A. of Scotland were encouraged to secure registration and a large number did so ; in the result they have formed the great majority on the Register. It is stated that under 500 of the 1,366 registered contractors are not members of one or other of the Associations. On the other hand, the E.C.A. has a membership of well over 2,000 pledged to observe a high standard in electrical work and possessing business integrity as a condition of remaining in the Association.

Another vitally important factor to the industry and the public has been the part which the E.C.A. organization has played in securing harmonious relationships with labour in the industry through the National Joint Industrial Council for the Electrical Contracting Industry.

It is considered that there has been a good deal of overlapping between the Register and the Association which has caused confusion in the minds of the public.

Reverting to the matter of compulsory registration, the E.C.A. says that it has had the undivided support of the Association of Supervising Electrical Engineers and the Electrical Trades Union. Other interested sections of the electrical industry are also in favour of compulsory measures and are represented on the " Donkin Committee " formed to pursue this object. Unfortunately the Institution of Electrical Engineers, through a Post-War Planning Commitee, has expressed the view that the danger to which the public is exposed by faulty installation work is not sufficient to warrant registration.

But in spite of this and of the fact that the Government Departments concerned have declined to consider the introduction of the necessary legislation, the E.C.A. is not abandoning its hope of eventual success. In the meantime the Association intends to pursue the advertising campaign which it began some time ago to induce the public to place its electrical work with members of the Association. It stresses the fact that membership of the E.C.A. forms a guarantee of good workmanship and stability and measures are under consideration for strengthening the appeal to the public.

Guide to Printing Practice

" Practical Guide to Printing and Stationery," by Hermes (Fitzroy Publications, 54, Grafton Way, London, W.1, price 2s. 6d.) contains information, with as little technical detail as possible, to enable anyone to prepare " copy " and give instructions to the printer. Subjects dealt with include lay-out or design, paper, type, ink and binding.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Executive Council of the Association of Supervising Electrical Engineers has elected **Mr. J. D. Griffiths** (Birmingham), as its chairman for 1946-47. **Mr. E. J. Sutton,** M.I.E.E., has been elected vice-chairman, and **Mr. J. J. Smith,** M.I.E.E., hon. treasurer.

Dr. C. C. Paterson (who received a knighthood in the King's Birthday Honours) is one of the new vice-presidents of the Royal Society of Arts. **Sir Frank Smith** has also been elected a vice-president.

Many readers will be interested to know that **Mr.** and **Mrs. A. H. Bridge** celebrated their golden wedding yesterday (Thursday). Mr. Bridge joined the editorial staff of the *Electrical Review* in 1891 and retired in 1938, after serving as commercial editor and director for many years. His present address is 60, Grange Park Avenue, Winchmore Hill, N.21.

Mr. A. W. Berry, director of the British Engineers' Association, and **Mr. D. M. Buist,** British Electrical & Allied Manufacturers' Association, are members of an F.B.I. delegation which left for Brussels this week at the invitation of the Federation of Belgian Industries to discuss trade relations between the two countries.

On July 6th employees of the Midland establishments of the General Electric Co., Ltd., turned out in force at the revival of their annual sports and gymkhana after an interval of seven years. There were about 5,000 spectators at the Witton Sports Ground, headed by Sir Harry Railing, Lady Railing (who afterwards presented the prizes), and the Hon. Mrs. Leslie Gamage.

Lady Railing presenting the M. J. & A. H. Railing Challenge Cup to the coach of the winning tug-of-war team (Foundry and Pattern Shop) at the G.E.C. Witton sports

The joint general managers of the Witton engineering group of works, Mr. J. J. Gracie and Dr. C. C. Garrard, were also present. As usual, parties from other G.E.C. works and branches made the journey to Witton, this time with considerable success as three of the four G.E.C. Challenge Cups were won by London, and the fourth by Coventry.

Mr. J. J. Thompson has been appointed sales manager of the Birmingham branch of Berry's Electric, Ltd. Before the war Mr. Thompson was a member of the London sales staff and after volunteering for service with the Forces attained the rank of major in the R.A.O.C., was awarded the M.B.E. and was mentioned in despatches.

Mr. J. J. Thompson

A sports day and victory celebrations for the staff, employees and members of their families, were held recently at Castle Meads by the City of Gloucester Electricity Department. The programme comprised various sports events for children and adults, " electrical " side shows, skittle matches, a comedy cricket match, and dancing. Alderman Clift, chairman of the Electricity Committee, acted as one of the judges, and prizes were presented to the winning competitors by Mrs. Emil Braathen. The arrangements were in the hands of the Committee, of which Mr. Emil Braathen, city electrical engineer and general manager, was president, Mr. H. E. Franklin chairman, and Mr. K. M. Robins and Mr. I. Chater, secretary and treasurer respectively. Mr. G. Hill acted as starter and master of ceremonies.

Mr. R. G. Mukherji, M.Sc., A.M.I.E.E., electrical executive engineer with the Works and Buildings Department, Government of Bengal, has taken charge of the Western Electrical Division at Calcutta. His address is 19, British Indian Street, Calcutta.

At a meeting of the Council of the Public Transport Association Inc., held on July 11th, **Mr. S. Kennedy** was elected chairman of the Council for the ensuing year, **Mr. J. H. Watts** and **Mr. Raymond Birch** were elected vice-chairmen.

In view of the expansion of E.A.W. Branches **Miss Mabel Reading** was recently appointed area organizer for the northern half of the South-East England Area, and is also in charge of the information bureau at headquarters. In her many years' experience of the electrical

industry she has held the post of chief demonstrator and saleswoman with the City of London Electric Supply Co., Ltd.

Mr. R. G. Clark, M.I.E.E., until recently head of the Research and Development Department of Philips Lamps, Ltd., has been appointed manager of the Engineering Departments of Ferguson Radio Corporation, Ltd., of Enfield, Middlesex. Mr. Clark joined Philips Lamps, Ltd., in 1928 and for several years was concerned with the design and development of Mullard valves. Subsequently for twelve years his activities were centred on general research and development work for the Philips organization.

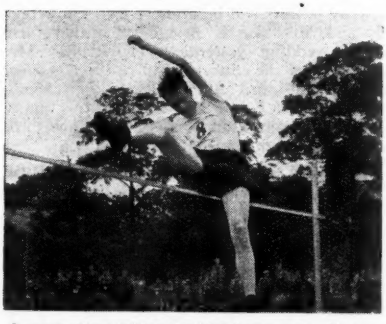
Mr. R. G. Clark

Mr. E. S. Booth, technical assistant to the Yorkshire Electric Power Co., has been appointed deputy city electrical engineer to the Salford Corporation in succession to Mr. T. E. Dransfield, whose retirement we recently announced. Mr. Booth joined the staff of the Yorkshire Electric Power Co. in 1938 as power station erection engineer and held the successive appointments of power station charge engineer, substation construction engineer and design engineer before being appointed technical assistant. He is an associate member of the Institutions of Electrical and Mechanical Engineers.

Mr. D. Holt, B.Sc., M.I.E.E., who has been with the Walsall Corporation Electricity Department since 1933, has now been appointed engineer and manager of the electricity undertaking in succession to Mr. E. A. Newburn who, as we have already reported, has been appointed city electrical engineer at Bath. Mr. Holt was educated at Manchester University and received his electrical training with the Rochdale Corporation Electricity Department, with whom he was appointed assistant engineer in 1923 and was subsequently promoted to assistant mains superintendent. He left Rochdale in 1933 to become district engineer with the Walsall Corporation. In 1935 he was appointed mains superintendent and in 1942 became chief assistant engineer. He was appointed deputy engineer and manager at Walsall in January of this year. The salary and conditions of the Walsall appointment are those of the N.J.C. for Local Authorities and Chief Electrical Engineers. The present full scale salary applicable to Walsall is £1,698 which becomes payable in the third year of the appointment.

Mr. D. Holt

Forming the biggest crowd seen at the Fallowfield ground for many years, 3,000 spectators attended the revival on June 22nd, after a lapse of six years, of the Metrovick annual sports. There were more than 350 entries from the Trafford Park works and teams from the Metrovick factory, Sheffield; B.T.H. factory, Rugby; and the Cosmos factory, London. Competition was very keen



A competitor taking the high jump at the Metrovick annual sports

and the most notable victory was that of R. A. Geldard, of the Manchester Wheelers, who carried off the Cattlow Silver Trophy. Metrovick (Trafford Park) won the one-mile relay race against teams from Rugby, Sheffield, London and a second from Trafford Park. B.T.H., Rugby, were first in the ladies' race. Among those present were **Sir George Bailey,** managing director of the A.E.I. group, and **Mr. I. R. Cox,** managing director of Metropolitan-Vickers. Mrs. Cox presented the prizes and was later given a book by the Sports Committee in appreciation of her help.

Mr. W. A. Ives is leaving this country to join Associated Electrical Industries (India), Ltd., in order to establish a lighting advisory service. His headquarters will be in Calcutta where the lighting service will initially be organized to cater for the whole of India. Mr. Ives has been with A.E.I. companies for fifteen years, dealing with lighting, with an interval during the war on Government service with the Ministry of Supply and with the Labour Department, Government of India. He has been transferred from the Lighting Section of the B.T.H. Co. to take up this new post.

Mr. A. G. Everett has been appointed works manager of the Cosmos Manufacturing Co., Ltd. Mr. Everett joined the A.E.I. Group in 1920 when he became a college apprentice with

the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park, being transferred shortly afterwards to what was then the Cosmos Lamp Works. After a brief period as technical assistant in the Manchester office of Metro-Vick Supplies he returned to Cosmos in 1923 and became chief lamp engineer in 1928. When lamp production was transferred to Edison Swan, Ponders End, he went there in an advisory capacity until his appointment as works manager in 1931, which position he has relinquished to take up his new post with the Cosmos Co.

Mr. W. G. Chilvers, A.M.I.E.E., has been appointed area officer of the North West England and North Wales Area of the British Electrical Development Association. Mr. Chilvers has been sales engineer and acting consumers' engineer with the Cardiff Corporation Electricity Department. He received his technical training at the Technical College, Wolverton, and general training with the Northampton Electric Light & Power Co., Ltd., with whom he later became district engineer. Mr. Chilvers has had considerable experience of rural development and farm equipment.

Mr. C. Nield, A.M.I.E.E., who has been appointed area officer for the Central England Area, was educated at the Manchester Grammar School and the Royal Technical College, Salford. After serving an apprenticeship with the Lancashire Dynamo & Motor Co. at Manchester, he went to the Ashton-under-Lyne Electricity Department. At the time of his appointment to the E.D.A. staff he was sales engineer with the Mid-Lincolnshire Electric Supply Co., Ltd.

Mr. R. A. Bayetto, who has been appointed assistant area officer of the South East and East England Area, received his training at Wimbledon Technical College, and in the Epsom Electricity Department, later becoming acting mains superintendent. Before joining E.D.A. he was district engineer with the Kirkcudbrightshire Electricity Department in charge of 300 sq miles. When the County Council set up a special publicity department Mr. Bayetto was selected to organize and operate it.

Mr. W. G. Chilvers

Mr. C. Nield

Mr. Chilvers was recently presented with an electric clock and iron by Mr. Edward Jones, M.I.E.E., M.I.Mech.E., city electrical engineer and manager, on behalf of the Cardiff Electricity Department staff, and with two etchings of Cardiff by the local branch of the E.A.W. **Mr. V. R. S. Treasure,** A.M.I.E.E., who has recently returned to the Electricity Department after service with the R.A.F., has been appointed to the position vacated by Mr. Chilvers.

Mr. G. E. C. Pedler, superintendent of the Turbine Section of the Construction Department of the British Thomson-Houston Co., Ltd., has retired after nearly forty-four years' service with the company. He obtained his early engineering training with Geo. Waller & Co., engineers and millwrights, and joined the B.T.H. Co. in February 1903, to erect plant and machine tools for the manufacture of Curtis steam turbines. After becoming charge hand on the turbine test pit he was sent, in September, 1905, to erect and put into commission at the Wandsworth generating station one of the first 1,500-kW vertical turbo-alternators supplied to the County of London Electric Supply Co. In 1906 he was appointed assistant foreman of the turbine section of the generator department of the B.T.H. Rugby Works, and in 1909 he was transferred to the Construction Department, being appointed district engineer for the Birmingham and Midland district in 1913. One of the notable installations which he supervised was that of the first two 15,000-kW turbo-alternators at the new Princes generating station Nechells, of the Birmingham Corporation. On the death of Mr. T. J. Reynolds in 1925 Mr. Pedler was appointed superintendent of the Turbine Section of the Construction Department. At a recent gathering in Rugby of the various district engineers and their assistants, and members of the Turbine Departments, Mr. J. S. Ramsden, senior commercial director, presented a silver salver to Mr. Pedler on behalf of his colleagues and friends. Mr. Pedler in addition received a Biro fountain pen.

Mr. G. E. C. Pedler

Mr. R. A. Bayetto

Mr. J. Ashton, who has been appointed acting superintendent of the Turbine Section of the Construction Department, was for the twenty-one years of Mr. Pedler's administration, his chief assistant. Mr. Pedler will continue to act for the company in a consulting capacity.

Mr. H. M. Goody, joint managing director of Brookhirst Switchgear, Ltd., has been appointed a magistrate for Cheshire.

Mr. J. E. Nunn, A.M.I.E.E., has been appointed chief assistant electrical engineer with the Kendal Corporation Electricity Department. Mr. Nunn was articled under Mr. W. E. Affleck, M.I.E.E., Guildford Corporation Electricity Department, and subsequently held appointments with the Guildford and Reigate undertakings and with the Air Ministry Works Directorate.

Following on the resignation of **Mr. S. H. Parsonage** as manager of Compound Electro Metals, Ltd., **Mr. M. Littman,** A.M.I.Mech.E., has been appointed managing director.

Mr. L. A. E. Fosbrooke, superintendent at Blackburn Meadows power station, Sheffield, has been appointed to a similar position at the Southwick station of Brighton Corporation Electricity Department.

Mr. J. Shipley, assistant electricity manager at Uttoxeter, has been appointed electricity engineer and manager to Ashbourne Urban District Council. He succeeds **Mr. H. Eagles.**

Mr. H. H. Fryer, A.M.I.E.E., has been appointed chief assistant engineer, and **Captain L. Johnson,** Graduate I.E.E., assistant mains engineer with the Douglas Corporation Electricity Department.

Dr. S. Wernick has been elected president of the Electrodepositors' Technical Society for 1946-47.

In the list of members of the I.M.E.A. Council for the ensuing year in our issue of July 5th, we gave the name of "Alderman A. E. Rose (Preston)." This should have been **Alderman H. E. Rhodes.**

Following the recent retirement of **Mr. M. A. Pike** from the position of chief engineer of the New Zealand Post Office, **Mr. E. H. R. Green,** M.Sc., M.I.E.E., his deputy, has been appointed to the post. Mr. Green is succeeded by **Mr. A. D. Baggs,** M.I.E.E., superintending engineer. **Messrs. G. R. Milne,** B.Sc., A.M.I.E.E., and **F. C. Gentry,** B.Sc., A.M.I.E.E., have been appointed superintending engineers.

Mr. A. H. Child, A.M.I.E.E., at present with Aylesbury Corporation Electricity Department, has been appointed consumers' engineer with the Maidenhead Corporation Electricity Department.

The second of the four inter-works athletic meetings between Hoffmann, Marconi's, Crittall and E. K. Cole, Ltd., was held at the Marconi Sports Ground, Chelmsford, on July 8th, the winners being Crittalls with 171 points. The award of the cup presented by the Ekco Sports and Social Club will depend on aggregate results including the next two meetings at the Crittall and Ekco Sports Grounds in August.

Obituary

Mr. E. Lancaster Burne, M.I.Mech.E., A.M.I.C.E., who died suddenly on June 12th, at the age of seventy-six, had been in practice as a consultant since 1905, mainly in connection with the design and supervision of engineering services for public institutions, hospitals, schools and business premises, his activities including electrical installations, steam boiler plant, laundry and cooking equipment, lifts and cranes. From 1895 until 1904 he was managing director of Dickinson & Burne, and during this period he developed an interest in windmills. He was the holder of several patents in connection with electricity generation by wind power, and built a number of small plants for export. His practice is being continued by Richards & Bright, 5, Bloomsbury Square, W.C.1, with whom he had been associated since 1943.

Mr. Edward Donoghue, former works superintendent of Blackpool Corporation Electricity department, died recently at the age of sixty-six after a long illness. Mr. Donoghue went to Blackpool over forty years ago, becoming a shift engineer in 1902 and works superintendent in 1934. He retired last October.

Mr. A. S. L. Barnes.—We learn with great regret of the death at the age of seventy of Mr. Arthur S. L. Barnes. Mr. Barnes was born in England and from 1900 to 1910 served as chief of electrical engineers at Gibraltar. For the past thirty-five years he had been with the Ontario Hydro-Electric Power Commission. He was for many years a regular contributor of articles on Canadian matters to the *Electrical Review.*

Mr. C. E. Saunders.—The death has occurred at Whitley Bay of Mr. C. E. Saunders, who was one of the first maintenance engineers at the B.B.C. studios at Eldon Square, Newcastle, in the early days of north-country broadcasting. Mr. Saunders was sixty-two years of age and retired five years ago through ill-health.

Mr. O. C. Wilson.—The death occurred on July 1st, at the age of seventy-eight, of Mr. Oliver Charles Wilson, J.P., chairman of the Sheffield Smelting Co., Ltd.

Mr. Bernard Freeman, managing director of Super Radio, Ltd., of Bradford, Nottingham and Keighley, died on July 4th at the age of forty-six.

Mr. James Wink, former branch manager in Aberdeen for the General Electric Co., Ltd., for thirty-one years, has died at his home, Cardonald, West Cults, at the age of sixty-eight.

Mr. J. P. Harbottle, a director of Harbottle-Leeson, Ltd., electrical wholesalers, Portsmouth, died on July 13th.

Will.—Mr. Leonard George Carter, managing director of the Carter Electrical Co., Ltd., Romford, who died on Sept. 22nd last, intestate, left £3,591 gross, with net personalty £3,295.

Colliery Electrical Engineers

Education and Training Proposals

By F. W. Maynard,
M.I.Min.E., A.M.E. & M.E.

IN its Report of 1938 the Royal Commission on Safety in Coal Mines referred to the need for a higher standard of training and education among engineers engaged in mining. Collieries are mechanized in very varying degrees, but there is no doubt that, owing to the shrinking recruitment, electrical and mechanical devices will to a large extent replace man-power. The effect of labour shortage will be considerably lessened if it can be shown that a youth having the necessary qualifications and character will, after suitable education and training, obtain an engineering post with both status and remuneration compatible with his efforts.

During the past few years, both the Institute of Mining Engineers and the Association of Mining Electrical and Mechanical Engineers, as a result of committee work, have produced plans which should go far to meet the requirements of the industry. The membership of the A.M.E.M.E. has increased to over 4,000 and therefore this body should be competent to assess what is required and, having branches and sub-branches in all mining areas, be capable of obtaining a good cross-section of mining opinion. Indeed, the Royal Commission stated: "If that Association (the A.M.E.M.E.) were able to propound a scheme of qualification to the complete satisfaction of the Mines Department, we can see no reason why it should not be accepted permanently as a substitute for State Certification".

Three Groups Suggested

There appear to be at least three grades into which trainees could be placed, depending upon whether they aspire to become engineers in control of a group of collieries or of single collieries, or whether they would be satisfied to receive craftsmanship training as colliery electricians and mechanicians. For all three groups an apprenticeship of about five years is necessary, and this should start at the school-leaving age, commencing with pre-entry training as suggested in the Forster Report. Some form of apprenticeship agreement should be entered into.

In regard to those who wish to become colliery electricians or mechanicians, the first year's training would consist of practical craftsmanship, most likely given at the colliery to which the apprentice was attached, and drawing, mathematics, general science and English at the local technical college. The second year would be taken up with the study of craftsmanship with a leaning to mechanical or electrical aspects and suitable subjects from the following: mathematics, drawing, magnetism and electricity, mechanics and heat and general science. The third year would have the following subjects: electricity, a.c. and d.c. principles, applied mathematics, engineering drawing, mine signals and lighting, mines regulations and more craftsmanship training. After this three-year period, the apprentice should be considered a suitable candidate for at least a second class certificate of competency as called for by the Report of the Royal Commission.

Further Practical Training

Thereafter the practical training would be sandwiched between the colliery and the technical college and continue in somewhat the following order:—

In the first year, six months would be spent in mechanical workshops, at the bench and using simple machine tools, in assisting the electrician or mechanician both on the surface and underground on simple work and in obtaining "pit sense"; this part would be arranged with the safety officer or the lad's foreman. During the second year, he would be engaged in dismantling and assembling simple machines and apparatus on the surface in association with a competent man and in general servicing of machinery and, below ground, in assisting the electrician on the easier maintenance tasks.

The third year would be occupied in the repair shops and on simple erection work both above and below ground. Six months of the fourth year would be spent at his own colliery on general maintenance and testing and six months at another colliery and/or at a manufacturer's works. General maintenance work and erection of new and removed plant and machinery, both surface and below ground, would complete the fifth year's training. Apprentices from this group, who showed the necessary ability, should

be allowed to pass to the higher groups after the third year.

The intermediate grade of beginner should have at least the School Leaving Certificate and should undergo a similar pre-entry training as for the previous group, possibly with a higher standard of technical training. The technical training, taken at a technical college, should be (at least) for 200 to 300 hours each year, partly in the evenings if necessary to work in with the craftsmanship training, which should be as for the first grade.

The subjects at the technical college should be: For the first year, mathematics, general science, simple drawing and English; for the second year, electrical principles, engineering drawing, mathematics, English, mine regulations, mine lighting and signalling; for the third year (after taking the examination for second class certificate of competency), electrical engineering, engineering drawing, diagram drawing, applied mathematics, mining machine construction and, of course, the necessary craftsmanship training.

After this third year's training the apprentice should be capable of taking a first class certificate examination of competency. The fourth and fifth years' training would then follow on the lines of the first grade; here again, any apprentice showing the necessary ability should be encouraged to go on to the third grade by means of scholarships and grants.

Higher Responsibilities

The third grade comes under a rather different category, as entrants would, no doubt, be responsible ultimately for the design and lay-out of colliery plant. This particular degree of ability and character can be built up only by training at a university or university college, the student spending in each year his vacations (excepting for, say, two weeks) at the colliery with which he was associated. While for this higher grade the technical training must be of a very high order, mining is such a practical job that craftsmanship training is just as important as with the other groups. A slide rule may serve to calculate the size of a shaft cable, but it certainly will not install it or lever it across the shaft to fit it into a cleat.

The standard of education for this advanced grade should be at least the Higher School Certificate, with credits in appropriate subjects. The period of training should include three years at a university, with craftsmanship training sandwiched in as suggested above, and then a further two years full time at a colliery or collieries.

The Association of Mining Electrical and Mechanical Engineers mentioned as the authority for carrying out examinations has devolved the duty of deciding the date and times of holding the examinations upon a committee, most of whose members are practising mining electrical or mining mechanical engineers. The chief examiners at present are Professor H. Cotton, of Nottingham University, and Mr. R. James, of the Treforest School of Mines and Technology. The test questions framed by the examiners are submitted for scrutiny and approval by a special committee of the Association.

Before being eligible to sit for an examination the candidate must provide full details of his experience which must be attested by the manager and by the engineer of the colliery at which the applicant is employed or to which he is attached.

Examination Methods

Examination question papers are distributed by registered parcel to the branch secretaries and the sealed packages handed to the invigilators on the morning of the examination; the invigilator opens the parcel in the presence of the students. After completion of the sitting the candidates' papers are sent by registered post to the appropriate examiner.

For the oral examination, candidates are examined in elementary principles, installation, testing and maintenance and general regulations as applied to mines. They are required to obtain 60 per cent of the total marks, and not less than 50 per cent in any one subject. The examiners for this section are practising mining electrical or mechanical engineers.

Written examinations are divided into three groups: Honours (first class and second class), first class and second class; before sitting for the honours examination candidates must have passed the first class examination. The subjects of the honours examination are: Electrical technology, transmission and distribution of electricity and the generation of electricity as applied to mining. To qualify the candidate must obtain 50 per cent of full marks and an average of 60 per cent on the three papers collectively.

For the first class examination, a candidate is examined in the following: a.c. and d.c. principles, lighting and signalling, electrical

regulations and a special subject. He must obtain 40 per cent of the total marks and an average of 55 per cent of all four papers. For the second class examination, he is examined in a.c. and d.c. principles, elementary mathematics and mining regulations. He must obtain at least 40 per cent of total marks for each paper and 50 per cent average on the four papers.

Many excellent men have left the mining industry because remuneration and status have not been comparable with those offered for similar posts in other industries, and if this wastage of the best men is to cease, this fault will have to be rectified forthwith. At many collieries to-day the amenities are better than at other works; a man may have a bath in magnificient baths before going home and at most collieries obtain anything from a full meal to a snack and cup of tea.

In any industry where man is pitted against nature, the work is hard, but there is also the grand feeling that there has been something accomplished. With increasing mechanization, there will be less hard manual work, while better lighting and transport below ground will make for more congenial conditions.

Danger Exaggerated

The popular Press has not helped in recruiting for the mines in the past. Far too often some comparatively minor accident has been magnified and described by such gruesome parlance as "groping round in the bowels of the earth, choked by fumes and dust," whilst in the same issue ten times the number of road deaths have been glossed over. Our mines are getting safer every day and they are the safest in the world. Although some accidents are to be expected, there is no reason for alarm or despair.

Although electrical apparatus in mines is being extended in both scope and power every day, there has been a relative decrease in the number of accidents. Figures given by the Electrical Inspector of Mines show that in 1932 there were 22,282 motors in use below ground, and that during that year there were 65 accidents, fatal and non-fatal, one for 343 motors. In 1943 the number of motors had increased to 34,184 and of accidents to only 71 or one for every 481 motors, most of this increase being accounted for by machines at or near the coal face.

British manufacturers of mining machinery and apparatus have full reason to be proud of their products. Their apparatus is the safest in the world and it is to be hoped that the use of other than British machines will be discontinued; the introduction of foreign mining machines was a war expedient which lowered the standard considerably.

The mining industry is able to absorb youths with the best brains, initiative, courage and skill, but there must be the assurance that status and remuneration are at least as high as in any other industry. The Government would do well to put into practice forthwith schemes of education and training, such as have been suggested by the technical bodies, and so indicate to youth the shape of things to come.

Palestine Electrical Trade

Large Increase in 1945

IMPORTS into Palestine last year of electrical apparatus were valued at £151,000 (Palestinian currency), compared with £105,800 in 1944. In addition electrical machinery for light and power and parts thereof were imported to the value of £68,600, nearly all of which was supplied by the United Kingdom. The appended table shows the principal items.

General business in Palestine, according to the latest report by Barclays Bank, was quiet in May, with prices falling gradually owing to the continued arrival of goods, mostly from the United States. Stocks of consumer goods were said to be piling up in Haifa Customs warehouses. Capital goods were being taken up eagerly.

Exports from Palestine of electrical goods and apparatus rose in value from £26,900 in 1944 to £56,700 in 1945, the principal items then being insulated tubes and lead tubes for electric wiring, £19,900; dry batteries, £10,100; insulated cable and wire lead-covered, £8,000; and insulated cable and wire, other, not exceeding 9 sq in. cross section, £4,700.

Class	1945 £ P	Inc. or dec. on 1944 £ P
Insulated tubes and lead tubes for electric wiring	500	– 600
Dry batteries	–	– 200
Insulated cable and wire, lead covered	4,600	+ 3,300
Ditto, other, not exceeding 9 sq mm cross section ..	14,500	+ 5,600
Ditto other, exceeding 9 sq mm cross section	9,700	+ 1,800
Electric cooking stoves ..	90	+ 90
Electric lamps, exceeding 16 V	17,600	– 9,100
Electric light fittings made wholly or mainly of metal ..	60	– 340
Electric lamps, gas filled or vacuum not exceeding 16 V	2,700	– 300
Electricity meters	5,400	+ 2,300
Electric refrigerators	500	– 1,200
Ditto parts	25,600	+ 19,100
Radio sets	6,200	– 1,000
Radio parts	16,900	+ 8,800
Electrical apparatus n.e.s. ..	8,500	+ 5,800
Electrical goods, other ..	38,600	+ 10,800

Views on the News

Reflections on Current Topics

PROTOTYPES of the new electric kettles which will shortly be available reveal a strong tendency to break away from conventional design. In many cases the reason is some technical improvement such as the incorporation of means to avoid risk of burning the hand from steam emitted from the top ; in others novel appearance is the object in view. It is a matter of opinion whether the housewife prefers her kettle to look like a kettle or something more like, say, a coffee percolator, but it seems to me that the day is a good way off yet when supply authorities providing kettles on hire will forsake the more stereotyped designs. I notice too that only in a very few cases are the loadings higher than 1,500 W. This, in my opinion, is rather a pity. With a 1,500-W loading boiling is, it is true, faster than by gas but another 250 or 500 W makes a most striking difference in performance.

* * *

So many new electric irons have made their appearance on the market that it is almost impossible to keep track of all of them. Most of them are still of the " utility " type and incorporate no features of especial merit or interest. A novel appendage to a new American model takes the form of legs which stand out from the base upon the pressing of a button on the handle and similarly return out of sight in the base when the iron is in use. The incorporation of an aluminium sole plate with cast-in element in another American iron takes advantage of the fact that aluminium has a higher thermal conductivity than sheet steel, but the claim made for it that it reduces the weight does not necessarily seem a point to be stressed. Yet another new American iron embodies a dual sole plate which enables the user by tilting the handle forward to use the toe section for ironing pleats and other inaccessible parts.

* * *

Since wood became scarce the practice of employing fibreboard containers has become general and a nice distinction in nomenclature has arisen. Before the war any packing case which was not made of wood was liable to be called a " carton." Now, however, fibreboard cases occasionally reach giant proportions and to call them cartons is akin to calling large-sized country residences " cottages." The Thames Board Mills, Ltd., which raises the matter, defines a carton as a small folding box for weights of an ounce or less up to a pound or two. Beyond this, up to 1 cwt, or even more, the fibreboard containers should be called packing cases, and for railway risk traffic they must conform to definite standards of quality and strength.

* * *

It is very difficult to judge from a photograph of an illuminated scene—indoors or out of doors—exactly what the standard of lighting is. I find that many people attempt to do this but it may be very misleading. The quality of a photograph of any object is mainly dependent on the " quantity " of light reflected from the surfaces of the objects and this " quantity " is conditioned by two factors—the light value and the time of exposure. Thus any photograph of " lighting " can only indicate in a very general way how the object is illuminated, but not the actual lighting value.

* * *

" Mountain Goes to Mahomet " will be an apt news heading if a proposal made at a meeting of the Leeds City Council is adopted. Complaints have been received from the village of Eccup, a widely-scattered community, that the inhabitants cannot obtain the advantages of modern sanitation, electricity and gas. At the Council meeting it was suggested that it would be easier to rebuild the houses of the village on a site nearer the sources of these amenities than to take the services to the present area. The villagers do not, however, think much of the idea.

* * *

The introduction of electricity has resulted in a number of revolutionary changes, but I have not hitherto come across a case of land being transferred from one country to another because of it. Higher Kinnerton Parish Council therefore looks like making history if its application to the Boundary Commission for the parish to be transferred from Flintshire to Cheshire is granted. One of the reasons put forward for the change is that electricity is dearer on the Welsh side of the border than it is in Cheshire. The move in this case is not likely, I gather, to have any international repercussions.

* * *

At a luncheon last week Mr. E. Shinwell announced that he " intended to make honest industries of both electricity and gas, and put them on their legs." Only Mr. Shinwell knows exactly what this means; some people believe that electricity is to provide legs for the shaky coal industry, and maybe help to shore up gas too.—**REFLECTOR.**

COMMERCE and INDUSTRY

Higher Electricity Output. Aid for Demobilized Graduates.

Electricity Generation

OFFICIAL returns rendered to the Electricity Commissioners show that 2,762 million kWh was generated (2,599 million sent out) by authorized undertakings in Great Britain during June, as compared with 2,652 million in the corresponding month of 1945, representing an increase of 4·1 per cent.

During the first six months of this year the total kWh generated was 20,481 million (19,320 million sent out) as compared with 19,245 million for the corresponding period of 1945, representing an increase of 6·4 per cent.

Employment in Electrical Industry

Statistics appearing in the June *Ministry of Labour Gazette* show that in April last 152,800 people were employed in the electrical engineering industry as compared with 152,200 in March and 133,900 in mid-1939. Of these 50,100 were females (against 28,000 in mid-1939). The total number of unemployed in the industry (United Kingdom) at May 13th was 2,560 (1,039 women). The total number employed in the electrical wiring and contracting industry in April is given as 46,200, comparing with 45,500 in March and 41,700 in mid-1939. Of these only 5,400 were women (2,800 in mid-1939). At May 13th a total of 985 were shown as unemployed including 86 women. The electrical apparatus, cable, lamp, etc., manufacturing group employed 236,100 people in April, compared with 236,900 in March and 195,900 in mid-1939, including 118,900 women (79,500 in mid-1939). The unemployment figures for this group as at May 13th were:—Total, 3,639; females, 1,747.

Technical and Scientific Register

A recent meeting of the Electrical Engineering Committee of the Technical and Scientific Register (Ministry of Labour Appointments Department) was attended by Sir Arthur Fleming, Col. Sir Stanley Angwin, Mr. J. R. Beard, Mr. W. K. Brasher (Secretary, Institution of Electrical Engineers), Mr. E. S. Byng, Mr. C. W. Marshall, Mr. E. A. Mills, Mr. H. J. Nunn, Dr. C. C. Paterson and Mr. C. Rodgers (B.E.A.M.A.). Amongst the various questions considered by the Committee were proposals for securing employment for men who joined the technical branches of the Forces immediately on graduation and are now being demobilized. They have not previously had industrial experience, but many have had the advantage of commissioned service in technical corps and have shown qualities of leadership and initiative which should be of great value to industry. Suggestions made by the Committee are likely to lead to experimental schemes of training in industrial concerns with a view to preparing these ex-service personnel for responsible posts. The Committee realizes that adequate pay arrangements will be required in order to make training schemes of this kind economically practicable.

The Committee stressed the importance of developing still further the close co-operation between the Ministry's Technical and Scientific Register and the Professional Engineers' Appointments Bureau, and expressed the hope that industry generally would make use to the fullest possible extent of the facilities offered by the Register. The Committee also considered a detailed report on the work of the Electrical Engineering Section of the Register which has on its staff fully-qualified electrical engineers.

Resettlement Courses

Illuminating engineering has now been accepted as a suitable subject for the resettlement courses sponsored by the Ministry of Labour and National Service. The first course of this kind has been taking place at the Borough Polytechnic, Borough Road, S.E.1., and is about to be concluded. It is anticipated that this will be followed by a somewhat more complete course, probably nine to ten months, to begin in September. Those interested should communicate with Mr. C. E. Greenslade at the above address.

New Joint Committee

The No. 2 (Yorkshire and North Lincolnshire, etc.) District of the Electricity Supply Industry has established a District Joint Committee of Local Authorities and Chief Electrical Engineers. An inaugural meeting took place in Leeds on July 9th when Alderman H. Lake, J.P. (Rotherham) was appointed chairman and Mr. F. Nicholls (city electrical engineer, Leeds) vice-chairman. A letter was read to the meeting from Sir William Walker (chairman of the National Joint Committee) who was unable to be present, congratulating the District on the establishment of the committee and wishing it success. This completes the organization of all districts in England and Wales.

Apprentices' Courses

An attractively produced brochure describing the various training courses open to apprentices has been issued by Ferguson, Pailin, Ltd., Manchester. The system of training has been carefully devised in each case, to ensure that the apprentice receives a thorough and progressive training in craftsmanship, or to befit him for executive or technical responsibilities. Emphasis is laid on the selective nature of the courses, so that the apprentice is guided in the direction of his natural abilities. Attention is also paid to the welfare side of the company's activities. Copies of the brochure may be obtained from the employment manager.

Cardiff Catering Equipment Exhibition

Considerable success attended an exhibition of electrical catering equipment arranged recently by the Cardiff Corporation Electricity Department, in collaboration with the British Electrical Development Association, at its showrooms at The Hayes. There was an excellent response to invitations sent to local

caterers both within and outside the Department's supply area, and great interest was shown in the exhibits, which included one of the new Santon automatic water boilers; Jackson double oven range, 6-ft hot-cupboard and boiling plate; G.E.C. single-oven range and stockpot stand; a new "Creda" double-oven range; and two Electrolux electric refrigerators; together with photographs of English Electric double, pastry and steaming ovens and grills; and Peerless baking ovens, mixers, mincers and slicers. A film show was also used to emphasize the advantages of electrical methods.

American Electrical Exports

In 1944 American electrical exports as a whole were approximately four times the value of those of 1939. The most spectacular advance was in the radio group the total value of which was $128,166,000 compared with $22,181,000 in 1939. This group represented more than a quarter of the total value of electrical material shipped. There was also a very big rise in the exports of power plant, particularly generating sets over 500 kW. In some of the smaller goods for household use there were declines. The U.S.S.R. and Latin American republics (notably Brazil) were outstanding markets, Argentina being an exception.

Spanish Trade and Industry

In a recent article on the Board of Trade's commercial review dealing with Spain (*Electrical Review*, July 5th, p. 25) it was stated: "Local production is said to be sufficient in most cases to meet all demands and except in a few cases there is slender hope of obtaining import licences." It should have been made clear that this referred to smaller material and not to the heavy plant mentioned in the paragraph immediately before the statement.

Reports on German Industry

The latest list of reports by industrial teams upon various branches of German industry include the following:—BIOS 362, "German Primary Battery Industry" (4s. 6d.); BIOS 414, "Brief Description of Research Work on A.C. Generators," by Prof. Dr. Ing. Humburg, Technische Hochschule, Hanover (6d.); JIOA 8, "German 200 cm Searchlight, Model 43" (4s. 6d.); JIOA. 10, "Investigation of German Searchlight Equipment" (3s.). A limited number are available at the Stationery Office and copies may be inspected at the chief public libraries and other institutions.

Home Aid Pamphlets

The Women's Press Liaison Department of the British Electrical Development Association has circulated with its notes on "Current Affairs" copies of three well-produced pamphlets bearing the B.E.A.M.A. imprint. No. 122 covers electric cooking and contains a statement of the points for which the housewife looks and the way in which modern electric cookers meet them. No. 123 deals with food protection and electric-refrigerators. (For some reason the two words are hyphenated—electric cookers are not.) The third pamphlet, No. 124 ("'Twas on a Monday Morning") is devoted to electric washing appliances. It illustrates a post-war wash-boiler and gives a brief specification for an electrically-driven washing device and wringer with a capacity of 10 gallons which is being developed. This will be of convenient shape and size for even small houses and flats.

Professional Classes Aid Council

The twenty-fifth annual report of the Professional Classes Aid Council, which is composed of representatives of most of the benevolent funds of the professional associations, shows that during the year £9,551 was spent in assisting 213 families. As a result of the gratifying response to the Council's appeal last April the amount raised in subscriptions and donations shows an increase of £909 and there is a balance in hand on the year, but it is pointed out that the number of new applications for assistance is growing.

Trolley-bus Bills

Three Bills to confirm Provisional Orders made by the Minister of Transport have been published (Stationery Office, price 1d. each). They relate to the operation of trolley vehicles along certain routes at Reading, Derby and Maidstone.

Switchboard Attendants' Agreement

The National Joint Industrial Council for the Electricity Supply Industry has circulated the new agreement, dated March 21st, relating to switchboard and substation attendants and their assistants. This consolidates the agreement of November 15th, 1929, and all subsequent amendments.

Cable Makers' Holidays

Last Easter the Joint Industrial Council for the Electrical Cable Making Industry instituted payment for statutory holidays. Clause (3) of the agreement has now been cancelled and a new clause substituted. This provides that payment for statutory holidays shall be subject to the employee being at work for the full normal working day immediately preceding and that immediately following the holiday, except that loss of time will not disqualify for payment if due to allowable lateness; medically certified personal sickness or accident unless the employee has been absent for longer than eight weeks before the holiday; where permission is granted; and in the case of accidents within the scope of the Workmen's Compensation Act.

E.P.E.A. Constitution

In the June issue of the *Electrical Power Engineer* it is stated that the National Executive Council of the E.P.E.A. has decided to refer to the Post-War Planning Committee a suggestion that the constitution of the Association should be inquired into with a view to its possible revision and improvement.

Works Fire Brigade Successes

The works fire brigade of the General Electric Co., Ltd., at the Four Ashes Factory (M. of S.), has in recent weeks taken part in a number of competitions in various parts of the country with considerable success. In the

National Fire Brigades' Association (Midland Districts) Competition at the B.T.H. Works Sports Ground, Blackheath, the brigade secured two trophies and five diplomas for various types of fire drills and ambulance work. At the recent National Fire Brigades' Association National Camp at Hastings, the brigade obtained first position in three events, and at the West Midlands Private and Industrial Fire Brigades' Association competition held on the sports ground of Butler & Co., Wolverhampton, the brigade was successful in five out of eight events.

Irish Electrical Imports

Evidence of a striking renewal of activity in the electrical trade in the Irish Free State is afforded by the official trade returns for the first quarter of the current year which show a total of no less than £434,252 as compared with only £60,663 in the corresponding three months of 1945, a more than seven-fold increase.

Class	Jan.–March 1945 £	Jan.–March 1946 £
Electric motors	2,314	15,453
Other electrical machinery ..	11,300	66,265
Electric measuring instruments and apparatus	57	17,039
Vacuum cleaners	1,723	6,002
Dry batteries and parts ..	1,277	1,987
Electric lamp bulbs	2,272	17,413
Electric fires, kettles, irons, etc.	978	13,476
Electric lighting accessories and fittings	6,098	20,603
Wires and cables, insulated ..	10,578	78,776
Telegraph and telephone apparatus	2,186	22,849
Radio apparatus	6,164	74,308
Electric cooking apparatus ..	338	15,630
Other electrical goods	15,378	84,451
Totals ..	£60,663	£434,252

Details of the imports are given in the accompanying table from which it will be seen that all the items show an advance, the most striking being in respect of electric wires and cables and in unclassified material.

Trade Publications

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Illustrated and priced folder on the "Dioptrion" lantern for main road lighting.

P. & B. Engineering Co., Ltd., Tamworth Lyne, Mitcham, Surrey.—Illustrated brochure describing thermal relays of the Golds type (Edmundsons Electricity Corporation, Ltd.) for protecting polyphase motors, star or delta wound, against overload, single-phasing and internal or external short circuits.

F. C. Heayberd & Co., Ltd., 28, Russell Square, London, W.C.1.—Illustrated and priced list (No. 1042) of standard battery chargers incorporating metal rectifiers.

Applicants should write on their firms' business notepaper.

Resin-bonded Tubes

The portion of B.S.316 (synthetic-resin varnished-paper boards and tubes for general electrical purposes) relating to boards was superseded in 1943 by B.S.1137, and that dealing with tubes has now been superseded by B.S.1314. Three types of bonded-paper circular tubes are dealt with in the new specification, the internal diameters ranging from ¼ in. to 3 in. Part 1 of the specification deals with finish, tolerance on dimensions, warping, electric strength, surface breakdown in air, water absorption, effect of hot oil, cohesion between layers, machining tests, and freedom from corrosive substances. Part 2 contains optional clauses dealing with electric strength of tubes with wall thickness above ¼ in. and power factor. The methods of test are fully described in appendices. Copies may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s.

Trade Announcements

Lionel Robinson & Co., Ltd., have announced the following recent appointments at their Preston Branch:—Mr. W. J. Montgomery (Levens Hall Lodge, Kendal—Tel. Sedgwick 7), district representative Cumberland and Westmorland; Mr. R. Beauchamp ("Perwick," Lostock Hall Road, Poynton, Cheshire—Tel. 2208), district representative Manchester area; and Mr. J. Pedder (Preston Branch, 25a, Winckley Square, Preston), sales and service engineer, refrigeration department.

G. P. Dennis, Ltd., have completely reorganized the wholesale section of their business which is now being managed by Mr. P. A. Redmond. They have also recently opened a branch at Hamilton Place, Northgate Street, Chester, under the management of Mr. J. F. Taylor.

The London office of Heenan & Froude, Ltd., is now at Duke's Court, 32, Duke Street, St. James's, London, S.W.1 (telephone: Whitehall 6177).

As from July 20th the address of the Manor Electric Oven & Fire Co. will be 53, Victoria Street, London, S.W.1 (telephone: Abbey 1782).

Annual Holidays

The works and offices of the Cressall Manufacturing Co., Ltd., will be closed from July 29th to August 5th inclusive, during which period no goods will be dispatched or received.

The works of Geo. Ellison, Ltd., and their associated company, Tufnol, Ltd., are to close from July 26th to August 6th.

Appleby & Co. are closing down for the period from August 3rd to 12th inclusive.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"CALOR-LUXE" percolator.

NEW BOOKS

Power Plant Commissioning. Prefabrication Technique.

Electrical Technology for Beginners. By G. W. Stubbings, B.Sc., F.Inst.P., A.M.I.E.E, Pp. 156; figs. 48. E. F. & N. Spon, Ltd.. 57, Haymarket, S.W.1. Price 6s. 6d.

Little revision has been found necessary in this, the second, edition of this non-mathematical textbook for students below matriculation standard which was originally published six years ago. Matter has been added on metal rectifiers, electricity supply regulations, cables and installation testing, and a greater number of numerical questions (answers to which are worked out in an appendix) have been included in the present edition.

The author gives (as in the first edition) 3,411 B.Th.U. as the heat equivalent of a kWh. The value given in the B.S. Glossary is 3,415. For electricity generation 3,412 is used, presumably in order to be in line with established practice, but the introduction of a third figure is likely to confuse a student.—C.O.B.

The Commissioning of Electrical Plant and Associated Problems. By R. C. H. Richardson. Second edition, revised. Pp. 372; figs. 181; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 25s.

Engineers who commission power plant are a careful and worthy fraternity, to whom the thanks of both manufacturers and users of machines and equipment are due. Their work is seldom explained or described except in somewhat stereotyped manufacturers' brochures. It was, therefore, an interesting task to review a book by an engineer who is evidently intimately experienced in the subject of plant commissioning.

The book is divided into six sections: alternators, alternating current motors, transformers, direct current plant, converting and rectifying plant, and circuit breakers. While the treatment is essentially practical, an adequate amount of basic theory is introduced to guide the reader towards more intensive examination of any type of plant in which he may be specially interested. There is an excellent bibliography and an adequate index. The electrical aspects of commissioning are well and clearly described with only occasional descents to engineering jargon. The outstanding example of jargon used by Mr. Richardson is the term " Kick Neutral Method."

All diagrams are clear, but many are sketchy. The numerous characteristic curves of machines would be rendered far more useful by the addition of quantitative scales. Effective and detailed vector diagrams are included in the transformer section. These should be of special service to engineers embarking on their " outside " experience.

Little guidance is given in connection with the mechanical aspects of commissioning, e.g., balancing of large machines and testing of circuit breaker mechanisms. The reviewer would also have liked to learn something of the man-hours and equipment required for commissioning various classes of plant. The book has, however, gone through its first edition in eight years. Considering the limited market for such a work and the nature of most of these eight years, this indicates that many share the reviewer's favourable opinion of the work. It is to be hoped that the author will be called on to provide a third edition in due course, as he seems capable of producing something approaching a classic of practical engineering literature.—C.W.M.

Prefabrication in Building. By Richard Sheppard, F.R.I.B.A. Pp. 148; 163 illustrations. Architectural Press, Ltd., 45, The Avenue, Cheam, Surrey. Price 18s. 6d.

This handsomely produced and profusely illustrated volume treats of all aspects of the technique and art of building prefabricated dwellings. The first five chapters cover general principles; the next three deal with particular examples in steel and non-ferrous metals, timber and concrete, both British and foreign (American and Swedish).

The final chapter is devoted to installations, in connection with which it is noted that prefabrication has not proceeded so rapidly, mainly because the saving which can be effected is of very small proportions. Much can be done, however to save time and expense by standardizing conduit lengths, etc., for incorporation during erection of the building. The author refers to obsolete wiring regulations and considers that the steel-conduit method gives an unnecessarily strong and wasteful installation. He mentions the American use of " a spiral wire which is flexible and electrically continuous " as worthy of consideration.

Brief reference is made to plumbing and kitchen units, including the kitchen-bathroom unit installed in Ministry of Works emergency houses.—J.H.C.

Collective Bargaining and Decadence. By A. Grant McGregor. Pp. 78. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, Kingsway, W.C.2. Price 5s.

The author holds that collective bargaining in the matter of wages and output lies at the root of this country's economic troubles. He advocates the free play of supply and demand and the introduction of what he calls " prosperity wages," payable to individuals at the employers' discretion, which should be raised when prices *fall* to increase consuming power and restore equilibrium.

Stocking Making

Electrical Methods Solve Production Difficulties

HOSIERY production is one of the five industries originally selected by Sir Stafford Cripps, President of the Board of Trade, for special attention with the aim of increasing output. At the Baldock works of the Fully Fashioned Hosiery Co., Ltd., makers of Kayser-Bondor stockings, where production is just getting into its stride again after partial requisition for use as a dispersal lamp factory, we were recently able to study the electrical methods now being adopted to improve and accelerate production, and raise the standard of working conditions.

At this factory, although production is at present principally concentrated on the production of fully-fashioned artificial silk stockings, a few are already being made of nylon. This remarkable material, a product of coal, is practically everlasting in normal wear, a thread of the yarn being claimed to be stronger than one of a similar gauge of steel. In its finished form it will always return to its original shape no matter how many times it is washed or stretched.

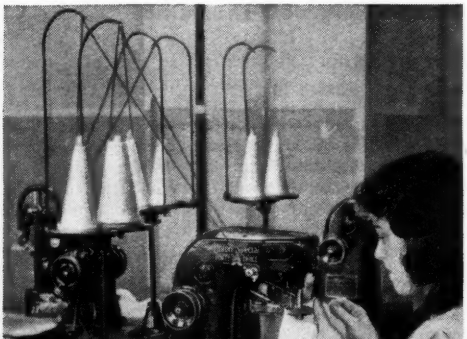
Except for the finishing process the manufacture of artificial silk and nylon stockings is almost identical. Special types of frames called legging machines are employed for the main process. In the first stage of manufacture, "barring on the welts," the cotton for the tops of the stockings is hooked on to elements attached to the "welt bar," a removable strip of metal about an inch wide and 14 inches long. There are 420 needles on each welt bar.

A double thickness of cotton is used for the welts for reinforcement so that, after about 4 in. has been knitted, what will eventually produce a picot edge at the top is introduced. After another 4 in. the welts are turned, the welt bars being removed and the stitches slipped down grooves on to corresponding needles on the machine. When the reinforced welts are completed artificial silk (or nylon) is substituted for the cotton and the knitting continues. To produce the narrowing fully-fashioned effect two stitches are cast off periodically, this being done automatically by means of a Jacquard chain device each line of which represents a course. When the heel is reached cotton is spliced in to form this "plating" or reinforcement in such a way that it shows only on the wrong side of the stocking. The plating of the heel finished, single knitting is continued until finally the toe is completed in double cotton.

Nylon stockings being knitted on legging machines. Note the Jaquard chain control device at the bottom

The latest types of machines have from twenty-four to thirty separate heads. All the heads are driven through a shaft extending the whole length of the machine by a single two-speed motor (2½-3 H.P.) a typical unit running at 1,400 and 900 r.p.m. The higher speed can be employed for the wider parts of the stockings to knit up to seventy-five courses a minute. When the stocking being made reaches the "plated" parts it is impracticable to proceed at the same speed without losing control of the yarn and the motor is automatically changed over to the low speed (maximum forty courses a minute). This slowing down is also automatically arranged for one course only at each

" narrowing " operation. The drive for this is particularly difficult in view of the large amount of " snatch " developed during the change-over from high to low speed.



Stitching up the seams

For knitting the various types of heels, machines employing the same general principles as the legging machines are used. Operating on a cam shaft in the same way as the legging machines they require generally ¼-H.P. motors and have automatic stopping arrangements. Some types of machine do four or more heels simultaneously. After the heels and soles have been linked, operators cut off the waste material and stitch up the seams of the heels and soles, the revolving tables on the machines used enabling stockings to be fitted on while others are being stitched. One 2-H.P. motor drives a batch of twelve of these trimming and stitching machines, each one of which is foot or hand controlled.

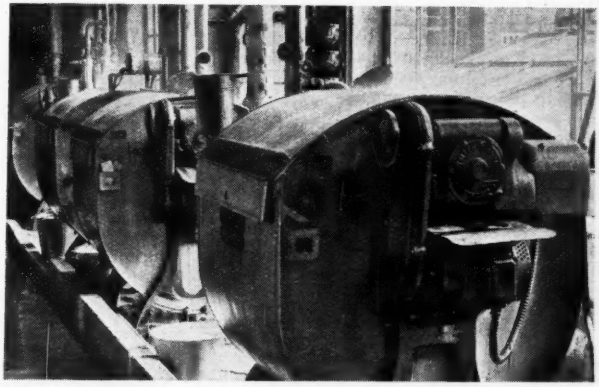
Seaming of the remainder of the stockings up the backs of the legs is done by machines operated by 2-H.P. motors through shafts fitted with slipping clutches, foot controlled. The completed stockings are then tested on a pneumatic machine which shows up any inherent weaknesses. The compressed air is provided by a compressor driven by a 3½-H.P. motor.

A stocking being tested for faults on a pneumatic device and (left) drying the stockings on electrically heated shapes

Two types of machine are used for the next process, dyeing. A closed drum unit, with four compartments, each holding fifteen bags of one dozen stockings, is revolved alternately in opposite directions every half minute by means of a ½-H.P.,

900-r.p.m. motor. The other type, which is open, is operated through Croft gears at 16 r.p.m. by means of a ½-H.P. motor running at 480 r.p.m. After remaining in these machines for three hours for all processes, the stockings have the surplus moisture removed in hydro-extractors which are operated by 5-H.P., 1,400-r.p.m. motors.

Before nylon stockings are dyed, they have to be treated in "preboarding" machines. Here they are placed on formers in a chamber heated with dry steam to a temperature of 260 deg F. After 2-2½ minutes the steam is shut off and they are automatically ejected. The stockings then fit tightly to the formers and will not go out of shape so long as their temperature does not exceed that used for the preboarding. Experiments are, however, now proceeding with infra-red-ray apparatus that may make it possible to eliminate the preboarding.



Electrically driven drum units used for dyeing

Leaving the dyehouse the stockings are dried on electrically heated shapes fitted with two elements loaded at 170 W and 540 W, high, medium and low heat thus being available. Twelve of these shapes are arranged in a row and the operator slips a stocking on one shape, passes to the next and on until he returns to the first which by that time has dried and set into shape, the whole cycle of operations thus being continuous. After grading, the stockings have their sizes transferred on to them by means of foot-operated electric heaters. They are then wrapped in "Cellophane" and boxed ready for dispatch.

Special attention has been paid to lighting throughout the factory and fluorescent tubes are now being employed to an increasing extent. An intensity of 28 f.c. at the works surface has been adopted as standard in some departments.

We thank Mr. H. Hooper, director, for granting us permission to visit the works and also Mr. L. S. Wilson, chief electrician and Mr. J. Albon, of the Production Department, for their help in the preparation of this article.

TRADE MARKS

THE following applications have been made for the registration of trade marks. Objections may be entered within a month from July 10th.

SEL (design). No. B634,883, Class 7. Electric motors (not for land vehicles), dynamos, model stationary steam and aircraft engines, none being toys, and parts. Also No. B634,884, Class 9. Electrical instruments and apparatus not included in other classes; scientific, optical, measuring, signalling and teaching apparatus and instruments; and parts.—Signalling Equipment, Ltd., Merit House, Southgate Road, Potters Bar.

MALPLAST. No. 640,415, Class 9. Electrical apparatus included in Class 9, scientific, measuring, etc., instruments and parts, all made wholly or partly of plastics. Also No. 640,416, Class 11. Bathroom fittings (being parts of installations), electric lighting fittings and lampshades, all being made wholly or partly of plastics.—R. Malcolm, Ltd., 601/602, Bath Road, Trading Estate, Slough.

WESTREX MASTER. No. 640,490, Class 9. Sound-reproducing installations, instruments and apparatus. — Western Electric Export Corporation, 111, Eighth Avenue, New York. Address for service: c/o F. C. Tomlins, 5, Mornington Road, Woodford Green.

MULTALITE. No. B638,684, Class 11. Electric lighting fittings.—Ferro-Steel Structures, Ltd., 7, Sunbeam Road, Park Royal, London, N.W.10.

HERMES. No. 640,720, Class 11. Heating and cooking installations, apparatus and appliances, and parts.—Plasto-Helicraft Engineering Co., Ltd., St. George's House, 193/7, Regent Street, London, W.1.

RECENT INTRODUCTIONS

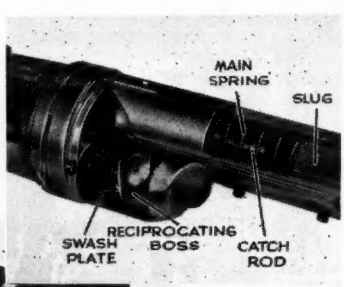
Notes on New Electrical and Allied Products

Portable Hammer

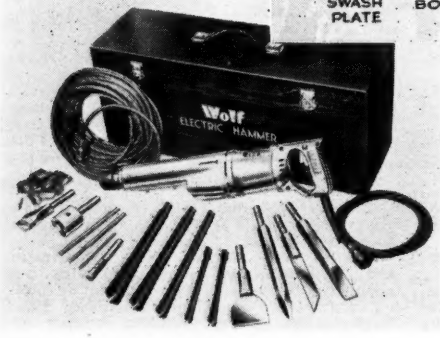
TO the range of electric hand tools obtainable from S. WOLF & CO., LTD., Pioneer Works, Hanger Lane, Ealing, London, W.5, has been added a portable pistol-grip hammer which is fully protected by British patents. The tool weighs 14 lb and is 20 in. long, its universal 275-W motor causing 700 blows (each of 4 to 5 ft-lb) to be struck per minute.

A mainspring actuates a heavy slug sliding inside a barrel with a follow-through action very similar to that of a pneumatic hammer. Pressure of the tool holder against the " work " forces the slug back along the barrel until it is locked by a spring-loaded catch-rod, which reciprocates, drawing the slug along the barrel against the mainspring until released by a trip bar. The compressed spring then forces the slug to impact against the toolholder, the catch-rod following to re-energize the mechanism for repetition of the cycle. There is no need to use the grip-switch in intermittent work for the tool will idle under no load.

The method of converting the rotation of the gear-box spindle into the linear movement of the catch-rod in the barrel is to spline the driving spindle to a circular swash-plate, which is surrounded by a rotatable bush. An arm mounted on the latter terminates in a ball-and-socket joint within the catch-rod which, sliding within the hammer barrel, restrains the rotation of the arm, so causing the bush to oscillate round the swash-plate, thus imparting reciprocating motion to the catch-rod.



Portable electric hammer, showing driving mechanism



Two complete kits are offered, one for the building and maintenance trade and the other as a utility outfit, each being packed with a variety of tools and accessories in a stout wooden carrying case.

Table Fan

Production of a table fan, which is of somewhat uncommon appearance, has been commenced by the ROCKMAN ENGINEERING CO., LTD., 16, Russell Street, Manchester, 1. The special feature claimed for this model is the design of the blades, which are said to operate silently and to create an unusually strong flow of air for a fan of this size; it is 12 in. high and long overall with blades of 9 in. diameter.

Silently-operating table fan

Fluorescent Lamp Starting Switches

Starting switches for tubular fluorescent lamps of the 80-W 5-ft size are now being produced by ELECTRO METHODS, LTD., 112, Brent Street, Hendon, London, N.W.4. They operate on the bi-metallic principle with a delay period of appropriate duration, and compensation for ambient temperature is provided for. Precious metal contacts are incorporated and the switch is totally enclosed in a moulded plastic case, arranged for plug-in fixing or with leads for connection to special fittings. The makers state that other sizes suitable for smaller fluorescent tubes are to be made in due course.

Dry Battery

A recent product of VIDOR, LTD., West Street, Erith, Kent, is a 67½-V dry battery of the layer-built type which is claimed to have a service life of 85 hours when furnishing 8 mA. The battery is designed to withstand any climatic conditions. Its dimensions are 2·7 by 3·7 by 1·3 in., suitable for miniature radio receivers of both British and American makes.

ELECTRICITY SUPPLY

Banbury Lighting Contract. Gateshead "All-Electric" Houses.

Banbury.—STREET LIGHTING.—At a recent meeting of the Borough Council, after considering proposals put forward by the local gas undertaking and the Shropshire, Worcestershire and Staffordshire Electric Power Co., it was decided to accept the tender of the S.W. & S. Co. The town has previously been lighted by gas with the exception of a few electric lights in the neighbourhood of Banbury Cross, and the new installation entails the provision of 221 lighting points with a 25-ft mounting height to provide group "A" lighting for approximately 6½ miles of roads, and 658 lighting points with a mounting height of 15 ft for lighting in accordance with the recommendations of the Ministry of Transport Street Lighting Committee for group "B" roads. The work will be commenced as material becomes available, and it is anticipated that the whole installation will be in operation in the autumn of 1947.

Birmingham.—MAINS AND SUBSTATIONS.—During the next twelve months the Electricity Committee is to provide general mains (£350,000) and substations and plant (£45,000).

Eccles.—SUPPLY TO FACTORIES.—At a meeting of the Corporation Electricity Committee it was reported that the Metropolitan-Vickers Electrical Co., Ltd., had taken over a hangar in Barton Moss Lane for the manufacture of electrical instruments and would require a supply of electricity for power, heating and lighting. Approval has been given to the provision of an additional supply of electricity at the Royal Ordnance Factory at Patricroft. The Ministry of Supply has agreed to contribute 50 per cent of the cost, estimated to be in the region of £43,000. In addition the Lancashire Electric Power Co. has accepted responsibility for the provision of a certain amount of equipment required in connection with the scheme and estimated to cost £22,000.

Gateshead.—"ALL-ELECTRIC" HOUSES.—Houses to be erected by the Town Council on the Lobley Hill, Coach Road and Lyndhurst estates are to be "all electric." It is proposed to buy 700 electric cookers and 700 boilers.

Largs.—AUTOMATIC STREET LIGHTING CONTROL.—The Town Council is to introduce an automatic system of street lighting control costing £2,728.

London. — WORKERS' REPRESENTATIVES ON J.E.A.—The Minister of Labour and National Service has given notice that as soon as may be after August 24th, he will designate to the London and Home Counties J.E.A., the employees' organizations having members in the employment of authorized undertakings in the District, in order that the organizations designated may choose two representatives to be members of the Joint Authority. Any employees' organization desiring to be considered for designation should make application in writing to the Minister not later than August 21st, on a form which may be obtained from the Secretary, Ministry of Labour and National Service, 8, St. James's Square, London, S.W.1.

Mansfield.—BULK SUPPLY TO COLLIERY.—The Electricity Department is to provide a bulk supply to the Mansfield Colliery of the Bolsover Colliery Co.

Mid-Cumberland.—EQUALIZATION OF CHARGES.—The Mid-Cumberland Electricity Co., and the Penrith Electricity Supply Co. are bringing their lighting flat rate charges into line with those of their associated companies in Yorkshire and Lincolnshire. This means that consumers who pay 7d. per kWh for lighting (6d. in Penrith) will now be charged 5½d. Those who pay through prepayment meters will be charged at 6½d. per kWh.

Reigate.—STRONG FINANCIAL POSITION.—Announcing the results of the year's working of the electricity undertaking, of which Mr. C. Rowbotham is engineer and manager, Alderman Lorkin stated that after the reduction of the domestic tariff standing charge and the abolition of meter rents there was a net profit of £8,891. During the year no new loans were raised but debt was repaid from revenue amounting to £10,731. Owing to uncertain conditions during the war it was deemed advisable to make annual rebates rather than adjust the tariffs, and over £35,000 had been returned to the consumers at a time when practically every commodity had increased in cost. It had now been decided to reduce the "unit" charge of the domestic tariff to ½d., and the standing charge by 25 per cent.

Scarborough.—SUBSTATIONS.—The Electricity Committee is to erect substations on the Highfield, Newby and Newlands estates, Filey.

Scotland.—FURTHER DISTRIBUTION SCHEMES.—The North of Scotland Hydro-Electric Board has submitted to the Electricity Commissioners distribution schemes for Harris, Barra and Arran. As a first step towards the Arran development it has been agreed, subject to the approval of the Commissioners, to transfer the Isle of Arran Electric Light & Power Co.'s assets to the Board.

South Shields.—STREET LIGHTING.—The Town Council has approved an estimate of £2,670 for the electric lighting of streets on the Marsden Road housing estates.

Swansea. — EXTENSIONS. — The Electricity Committee is to provide supply to the Gendros housing estate (£13,118) and an additional supply to a new factory for Aaron Thomas & Co. at Upper Bank (£3,098).

TRANSPORT

Spain.—TWELVE-YEAR PLAN.—Electrification of a further 2,500 miles of railway at a cost of 5,000 million pesos (£114 millions) is provided for in a twelve-year plan launched by the Government.—*Reuter's Trade Service.*

South Shields.—TUBE RAILWAY SCHEME.—A plan proposed many years ago by Mr. E. W. Chalmers Kearney, for a tube railway under the Tyne between North and South Shields railway stations is to be revived at the next meeting of South Shields Corporation Trade and Commerce Committee.

Electrical Progress in Eire

Electricity Supply Board's Report

A CONSIDERABLE increase in the sale of electricity during the year ended March 31st last is shown in the annual report of the Electricity Supply Board for Eire. The gross revenue for the year was £3,075,938, as compared with £2,477,900, and after deducting working expenditure (including depreciation) of £1,947,696, and interest, repayment of advances and discharge of capital liabilities acquired with local authority undertakings, amounting to £982,955, there is a surplus for the year of £145,287, as against a deficit of £324,353, which reduces the accumulated deficiency on the net revenue account to £387,522.

Favourable Water Conditions

The high output of the Board's stations during the year—482 million kWh—was made possible by the relatively favourable water conditions which prevailed. Of this total 319 million kWh was produced by the hydro-electric plants. The production of the balance of 163 million kWh from the steam plant was attained with considerable difficulty, particularly because of the inferior quality of the coal. The consumption of coal per kWh generated averaged 2·3 lb as compared with an average of 1·5 lb in 1939. This factor, taken in conjunction with the price of coal, rendered inevitable abnormally high costs for the output from the steam plant.

Sales of electricity amounted to 379 million kWh, as compared with 319 million kWh in the preceding year (during which severe rationing was in force and consumption was thereby reduced). The principal increases were in the sales for domestic purposes (from 116 million to 141 million kWh), and motive power (from 128 million to 150 million kWh). Domestic consumption however was still below the previous highest figure of 143 million kWh reached in the year ended March 31st, 1942. Increases were made in tariffs as from the beginning of the June/July, 1945, period.

Appliance Sales

Sales of appliances amounted in value to £41,422, as compared with £24,778, and after charging expenses and interest on working capital, there was a profit of £2,486. The Consumers' Installation Department also showed a net profit of £4,244 on contracts completed and invoiced amounting to £72,043. In connection with the hydro-electric development of the River Erne, the electricity supply undertakings at Ballyshannon and Bundoran were acquired on January 1st, 1946.

During the year the outline of the organization for carrying out the rural electrification schemes was drawn up and the nucleus of the staff appointed. The principal difficulty experienced in obtaining materials was the shortage of wooden poles, but a sufficient number was obtained to enable arrangements to be made to start the scheme on a small scale and the first area for development was selected—about 25 sq. miles in County Dublin to the north of Finglas.

Contracts were placed during the year for the supply of a second 12,500-kW turbo-alternator and a third boiler unit of 125,000 lb of steam per hour, two 20,000-kVA and two 2,000-kVA transformers for Portarlington power station. Contracts were also placed for the main construction works, including the dam, the power station and tail race for the hydro-electric scheme of the lower River Liffey at Leixlip. The plant will include a 4,000-kW generating set together with transformers and switchgear. The erection of the second main generating set at Pollaphuca (Liffey) station is expected to be completed this year.

With regard to the development of the lower River Erne, the Cliff power station will have an installed capacity of about 10,000 kW under the partial development, increasing to about 20,000 kW under the full development. Cathareen's Falls power station will have an installed capacity of about 40,000 kW, with room for extension to 60,000 kW under the full development. The average useful output of energy is estimated at not less than 160 million kWh per annum under partial, and 200 million kWh per annum under full, development. The execution of the partial development scheme was approved by the Minister for Industry and Commerce under Order dated April 27th, 1945, and by the end of the year preparations on the site had been well advanced and the works were about to be commenced.

Coal Mining Statistics

THE Annual Statistical Statement for the Coal Mining Industry for 1945, issued this week, would be more useful to engineers if it showed the cost of power used. About 6 per cent of the saleable coal raised is consumed in the mines, but the proportions vary greatly from area to area, being, for instance, less than 2 per cent in Northumberland and over 10 per cent in Lancashire. Expenditure on purchased power is presumably included in " other costs of production," which amount to 5s. 7d. per ton out of the national total of 35s. 10d. This, however, bears no relationship to the percentages for mines' use; while " other costs " in Northumberland are a few pence under the average, in Lancashire they are nearly 1s. per ton more.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The General Electric Co., Ltd., in its report and accounts for the year ended March 31st last shows a profit on trading and income from investments, including the profits of the subsidiary companies, of £1,950,554, as compared with £1,880,697 for the preceding year, and after deducting £449,788 for depreciation, £3,000 directors' fees, and £121,353 contribution to pension fund, there is a net profit of £1,376,413 (against £1,303,119). With £964,270 brought in this makes £2,340,683 available. Income tax requires £770,000, and after meeting the preference dividends and the ordinary dividend (10 per cent plus 7½ per cent bonus), a balance of £991,790 is carried forward.

The report states that a large volume of orders has been received, leaving the order book at the close of the year in a strong position, but the cancellation of Government contracts and labour shortages have created difficult problems in the factories. Export business is increasing rapidly and all operating overseas companies have shown good results for the year. Those companies which were located in enemy occupied territory have recommenced operations since the close of the year. The number of employees at March 31st was approximately 50,000. In addition 5,600 employees were still serving with the Forces. The contributory pension fund continues to grow: the membership now reaches nearly 13,500 whilst the assets held by its trustees exceed £4,000,000.

The Electric Development & Securities Trust, Ltd., a subsidiary of the General Electric Co., reports an income for the year to March 31st of £156,314 (£195,012) and a net profit of £69,227 (£80,787). The ordinary dividend is 7 per cent tax free (against 8 per cent tax free last year) and £17,526 (£18,299) is carried forward.

Chloride Electrical Storage Co., Ltd.—The gross profit for the year ended March 31st last, £486,928, was lower than for 1944-45 (£526,033) but after providing for taxation the net figure was £346,424 (against £301,033). Reserve for development, etc., receives £100,000 (£50,000) and employees' funds £57,000 (same). With a 5 per cent Victory bonus the total ordinary distribution is raised from 15 to 20 per cent, and £171,877 (£203,913) is carried forward.

Hoover, Ltd., have declared an interim ordinary dividend of 5 per cent (against 3½ per cent). The directors point out that this is only a reversion to pre-war practice and should not be taken as an indication of the total distribution for the year.

British Thermostat Co., Ltd.—The annual meeting was held recently at Sunbury-on-Thames. In a statement circulated to shareholders Col. N. Hudson (chairman) says that at the end of the year Teddington Controls, Ltd., their subsidiary, was temporarily established in various buildings at Merthyr Tydfil, pending completion of a new factory which has been sponsored and financed by the Board of Trade. Practically the whole of their aircraft products have been transferred to their subsidiary, leaving the parent company free to revert to heat control instruments and new lines. The order book is satisfactory, covering substantial orders both for the home and export markets. Additional capital will be required to finance the wider scope of the company's activities, and application has been made to the Capital Issues Committee for permission to increase the company's capital and to issue further shares. These will be preference shares which will be offered to shareholders on favourable terms.

The Harland Engineering Co., Ltd., reports a profit for 1945 of £17,296, as compared with £16,678 for 1944. General reserve receives £7,000, and the ordinary dividend for the year is maintained at 7 per cent. The balance carried forward is £16,002 (£14,800). The report states that the difficulties of the change-over period are not being allowed to retard the enhancement of productive assets and considerable sums are being spent on new plant and more efficient manufacturing resources. The new issue of capital made in February last will provide funds for the necessary capital expenditure.

Thorn Electrical Industries, Ltd.—Subject to approval of an increase in the capital from £150,000 to £206,250, shareholders will be offered 225,000 new ordinary 5s. shares at 27s. 6d. in the ratio of nine shares for every 16 held. The company requires additional capital for expansion and £150,000 for the purchase from the chairman of the company of the entire issued share capital (£45,000) of the Ferguson Radio Corporation.

Kerry's (Great Britain), Ltd. (formerly the East London Rubber Co., Ltd.), reports a net profit for the year ended February 28th last of £157,733, as compared with £126,178 for the previous year, which with £55,800 brought in makes £213,533 available. General reserve receives £25,000, and the ordinary dividend for the year is raised from 10 per cent to 15 per cent. The balance carried forward is £46,783.

In his statement which accompanies the report, Mr. E. P. Richardson (chairman), says that on the distributive side of the business, turnover increased during the second part of the year, but they were still hampered by lack of supplies in nearly all departments. Since the end of the financial year they have acquired the business of Henry Broadbent, Ltd., manufacturers of lathes and other machine tools.

The Metropolitan Electric Cable & Construction Co., Ltd., in its accounts for 1945 shows a net profit of £33,354 (£56,881) of which tax takes £14,000 (£34,250); there is no provision for deferred repairs (last year £2,000). The final ordinary dividend is maintained at 15 per cent and £48,137 (£33,583) is carried forward.

Ultra Electric (Holdings), Ltd., proposes to pay an ordinary dividend of 10 per cent; this is the same as last year, but is on increased capital.

Crossley Bros., Ltd., report a net profit for 1945 of £42,026, as compared with £35,872 for the preceding year. The deferred ordinary dividend for the year is raised from 10 to 12½ per cent.

Crossley-Premier Engines, Ltd., report that the net profit for 1945 rose from £18,615 to £41,773. The ordinary dividend for the year is 25 per cent (against 10 per cent).

The Telephone Manufacturing Co., Ltd., reports a net profit for 1945 of £272,495, an increase of £54,776 compared with the preceding year. The final dividend is 6½ per cent, again making 9 per cent for the year.

The Telegraph Construction and Maintenance Co., Ltd., is again paying an interim ordinary dividend of 5 per cent, this year on increased capital.

General Electric Co. (America).—The president said at the annual meeting on July 9th that the company had arranged a "line of credit" of $100 million, upon which it could draw if funds were needed. The president added that so far the company had not found it necessary to borrow money, but the credit had been arranged and any borrowings "would be on a short-term basis at a low rate of interest, and with the right of repayment." At the same time, he said that he expected the company's sales would be at the rate of $1,000 million annually by 1948. The highest pre-war sales were reached in 1941 ($679 million), and the peak was in 1944 when the sales totalled $1,353 million.—*Reuter* (Schenectady).

New Companies

Inductive Appliances, Ltd.—Private company. Registered July 4th. Capital, £5,000. Objects: To carry on the business of manufacturers, installers, maintainers and repairers of, and dealers in, electrical goods and apparatus and control gear, etc. Directors: G. T. K. Lark, "Ashfield," Strathmore Road, Rowlands Gill, Co. Durham, and S. Anderson, "Etherley," Burnopfield, Co. Durham. Registered office: Dipton, Co. Durham.

Jelson Electric, Ltd.—Private company. Registered June 24th. Capital, £2,000. Objects: To acquire the business of manufacturers of and dealers in domestic electrical appliances carried on by W. V. Jelfs, G. Johnson and J. P. Moulson, as the "Jelson Electric Company." Directors: W. V. Jelfs, 70, Manor House Lane, Yardley, Birmingham, and two others. Registered office: 2061, Coventry Road, Sheldon, Birmingham, 26.

Sign Components (Eastern Counties), Ltd.—Private company. Registered June 13th. Capital, £100. Objects: To carry on the business of manufacturers of, and dealers in, vacuum discharge tubes and lamps, electric lamps, radio valves, etc. Directors: C. Gates, 35, Britannia Road, Norwich; and H. L. Down, 67, Westmere Drive, N.W.7. Registered office: 39-41, New Broad Street, E.C.2.

Jones Electrics, Ltd.—Private company. Registered June 22nd. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, radio and television contractors and engineers, etc. Directors: W. A. Goodenough, Alnaschar, The Avenue, Fareham, Hants, and two others. Secretary: W. E. Price. Registered office: 15, Canal Walk, Portsmouth.

Senior Lighting Co., Ltd.—Private company. Registered June 28th. Capital, £500. Objects: To carry on the business of manufacturers of, agents for and dealers in electrical and mechanical apparatus and accessories, and in particular fluorescent and other electrical lighting equipment, etc. Directors: L. W. R. Wratten, 54a, High Street, Staines, and T. E. Hall, 7, Hooton Road, Yiewsley, Middlesex. Registered office: 54a, High Street, Staines.

A. Scott & Sons (Lincoln), Ltd.—Private company. Registered June 20th. Capital, £1,000. Objects: To carry on the business of electrical engineers and general electrical installation contractors, lighting specialists, etc. Directors: A. Scott, 7, The Strait, Lincoln, and two others. Registered office: 7, The Strait, Lincoln.

Allenby & Stokell, Ltd.—Private company. Registered June 24th. Capital, £5,000. Objects: To carry on the business of electricians, electrical, mechanical, civil and constructional engineers, turners, etc. Directors: G. W. Allenby, 20, Fearnville Avenue, Leeds, 8, and two others. Registered office: 62, New Briggate, Leeds, 1.

Modern Electrics, Ltd.—Private company. Registered July 1st. Capital £1,500. Objects: To carry on the business as indicated by the title. Directors: H. Barton, 99, Woodhall Lane, Welwyn, Herts, and three others. Secretary: R. G. Kirkpatrick. Registered office: 64, Wool Exchange, 25-29, Coleman Street, E.C.2.

Electro-Dynamic Services, Ltd.—Private company. Registered June 24th. Capital, £1,000. Objects: To carry on the business of electrical equipment specialists, etc. Directors: H. T. Percy, 7, Orphanage Road, Erdington, Birmingham, and C. E. Clarke, 186, Walford Road, Sparkbrook, Birmingham.

Plomer & Wilkinson, Ltd.—Private company. Registered June 18th. Capital, £5,000. Objects: To carry on the business of electrical, radio, television, telephone, refrigeration, heating and lighting engineers, etc. Directors: S. G. Plomer, 75, The Grove, Moordown, Bournemouth, and two others. Registered office: 129, Charminster Road, Bournemouth.

Bankruptcies

M. Skulnick, battery manufacturer, 83, Wellesley Court, Maida Vale, London.—Last day for receiving proofs for dividend July 23rd. Trustee: Mr. P. Phillips, 76, New Cavendish Street, London, W.1.

E. B. Page, electrical engineer, 10 and 12, John Street, Hyde, Cheshire.—Last day for receiving proofs for dividend July 24th. Trustee: Mr. P. M. Milward, 20, Byrom Street, Manchester, Official Receiver.

I. F. Berners and **C. J. Berners**, trading as Major Manufacturing Co., 98, Great Tower Street, London, E.C., battery manufacturers.—Last day for receiving proofs for dividend August 2nd. Trustee, Mr. S. E. Lane, Salisbury House, Finsbury Circus, London, E.C.2.